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CONGRATULATIONS

We offer our heartiest felicitations to the Hon'ble Rao Bahadur Ch. Sir Chhotu Ram, Revenue Minister, Punjab, and the Ex-Vice-Patron of the Punjab P. C. Fruit Development Board, on the auspicious occasion of his Golden Jubilee which is being celebrated by a large number of his admirers in every corner of the province, this month.

EDITOR-IN-CHIEF.

But now he is no more in this world.

STOP PRESS

It is a great pleasure to announce that the title of Sardar Bahadur has been conferred on Sardar Sahib Sardar Lal Singh, Fruit Specialist, Punjab, and Honorary Secretary of the Punjab Provincial Co-operative Fruit Development Board, and the title of 'Rai Bahadur' on Rai Sahib Janki Das, a distinguished member of the Executive of the Board. We offer our heartiest congratulations to them.

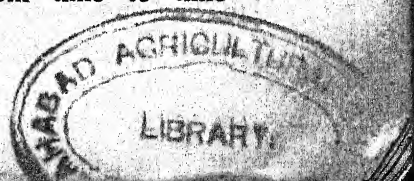
Preface

There is an extreme dearth of authentic literature dealing with fruit and vegetable preservation pertaining to Indian conditions, as books written by foreign authors, do not fully answer our purpose. There was, consequently, a keen demand for the publication of suitable literature on the subject. And this demand has been still further intensified by the present war inasmuch as importation of foreign products has almost completely stopped, there is need for local production, and in fact, a rare opportunity to develop this industry when it can have normal chance of survival without being strangled by foreign competition. But the absence of suitable advice, guidance and knowledge on the subject greatly stands in the way, leaving apart, of course, the active sympathy of the national government. Imperial Council of Agricultural Research has, no doubt, rendered yeoman's service in this direction.

So far as literature is concerned it was but natural that the Punjab Fruit Section—biggest of its kind in India and having a staff highly trained in this branch in foreign countries—should be called upon to meet this demand. Fruit Products* Laboratories at Lyallpur have done pioneer's work in this line for over a decade. The presence of a large amount of machinery at Lyallpur—a complete canning plant, a modern juice plant, a dehydrater, a boiler, steam pans and such other machinery easily worth

Rs. 50,000|- and capable of canning fruits and vegetables, manufacturing squashes, jams, marmalades, juices, etc., on commercial scale has made it possible for the staff to collect data of great practical value. Several short courses as well as advanced courses in fruit preservation, conducted annually for a number of years, attract students from all over India, Assam, Bombay, U.P. Orissa, Baluchistan, Sind, etc., and even Ceylon. In fact, this is already an All-India Training Institute. Apart from this, a large amount of experimental and research work conducted here and jointly financed by I.C.A.R. and the Punjab Government during last decade has also yielded most valuable results. Lastly a great deal of work on dehydration of vegetables and other fruit products, being conducted on behalf of the Army Supply Department, is also responsible for the accumulation of a good deal of information. And it would be in the fitness of things if all this information be made available to those interested in this industry.

The Fruit Section Staff has been hoping to issue an authentic publication which may serve as a guide to prospective manufacturers of fruit and vegetable products as well as a text book for the students. Although most of the material for such a book has been ready for some time past and it only requires to be put in final form, yet its publication had to be postponed from time to time on



account of pressure of other urgent duties. Now the war has placed additional strain on the staff and besides this, the cost of paper, printing, etc., has also increased tremendously with the result that publication of the proposed material may have to be postponed till after the War. In the meantime it has been suggested that just as the results of all experimental work on fruit culture carried out in the Punjab, were made available to the public in popular language in one volume in the form of Annual Number of the Punjab Fruit Journal 1940, which was highly appreciated by all interested in the Fruit industry, similar efforts should be made to make available the literature on fruit preservation. And this has been attempted in this small publication. A certain amount of material which, although already published in the form of leaflets, bulletins or articles in various journals but which happened to be unavailable at present, has also been included in this publication. In order to effect strict economy in the use of paper and to give the maximum material, not only the printing has been done very closely but all theoretical discussion has been avoided. And in most cases only the recipes of various products and their methods of manufacture have been considered sufficient. Economy in expenditure is further necessitated by the fact that this issue of the journal, although several times bigger than the normal issue, is to be supplied to the regular subscribers at no extra cost.

While it cannot be claimed that manufacture of every fruit and vegetable product has been discussed, it is safe to say that no important product has

been left out. This publication, among other items, deals with the manufacture of orange squash, lemon or lime squash, lime juice cordial, lemon barley water, tomato juice, jaman juice and syrup, unfermented apple juice, mango squash, tomato ketchup, jam from pears and plums, orange marmalades, jams, jellies and marmalades from Punjab fruit; canning of pears, mangoes, and grape fruit; dehydration of vegetables and pickling of vegetables.

LAL SINGH,

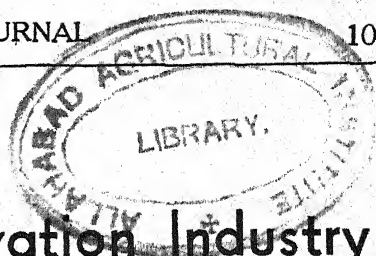
Editor-in-Chief.

(Fruit Specialist, Punjab).

IMPORTANT NOTE



The Chief Editor does not hold himself responsible for the views expressed in the articles published by various contributors in this Journal.



Future of Fruit Preservation Industry

By

S. Lal Singh, B.Sc. (Hons.),
M.Sc. (Calif.),

Fruit Specialist, Punjab, Lyallpur.

Thanks to the special interest taken by I.C.A.R. and almost all the Provincial and State Governments, the fruit industry in India has made rapid strides in recent years. This has naturally brought into prominence the question of fruit preservation which is rightly called the safety valve of fruit industry and on which the sound and healthy development of fruit industry so largely depends.

A questionnaire circulated by Dr. W. Burns, Agricultural Commissioner to Government of India, to all Provincial Horticulturists, couple of years back, elicited most valuable information on the dire necessity of developing this industry. It showed that the immense quantities of fruits, amounting in some cases to 25—50% of the total crop, either go to waste or fetch very unremunerative prices; and all this, in the face of bitter truth that per capita consumption of fruit in India is extremely low as compared with that of other civilized countries of the world. One of the main reasons for this sad state of affairs is that most of the fruit ripens at the same time producing a glut in the market which is detrimental both to the grower and the consumer—the former gets ridiculously low price for his produce and the latter enjoys fruit for a

short season only and later on he has to pay unusually high price for the same or go without it. It is not uncommon to find in most markets of the Punjab, tomatoes selling at a rupee per maund in June, desi peas at couple of rupees a maund in April, Sangtra and Malta Oranges at one to two rupees a hundred in January-February, excellent pears in Kulu Valley at a rupee or so per maund in August, juicy type mangoes at a rupee or two per maund in July in sub-mountain tracts like Hoshiarpur, Gurdaspur. Such examples could be multiplied ad-infinity not only in the Punjab but almost everywhere in India.

In other civilized countries of the world this state of affairs is avoided by the systematic plantation of early, mid-season and late varieties of fruits, the establishment of cold storage plants for prolonging the period of availability of any particular fruit, and above all the installation of a chain of fruit preservation and bye-products factories to take care of all the surplus and unsaleable fruit. It is no exaggeration to say that fruit industries, even in foreign countries, would not survive a season in the absence of cold storage plants and fruit preservation and bye-products factories.

These factories are able to utilise, for

various bye-products, all the surplus, unsaleable or inferior quality fruit (windfalls, small sized or oversized or misshaped fruit or fruit injured by birds or otherwise defective but healthy fruits) with the result that fruit growers are able to dispose of all their fruits at remunerative prices. In fact, attempt is made to use every part of the fruit.

In the process of canning peaches, stones are not discarded but kernel of the stone is used for extracting oil, residue is used as feed for cattle and shells of stones as fertilizer. In the process of canning pears or other fruits, cores and peels etc., are not discarded but utilized for the manufacture of vinegar or alcohol. In the case of citrus fruits, not only is the juice utilized for squash, cordials etc., but the peel (i.e. skin) is also used for marmalade and candying purposes. In the case of surplus peel, firstly oil, which sells at about Rs. 12 per pound, is extracted, secondly peel is boiled to extract pectin—a substance required for jelly-making and sold at a high price. The residue is used as feed for animals or as fertilizer for crops. In our fruit products laboratories at Lyallpur, the citrus fruits are being actually utilized in the above manner as demonstration to those interested in the industry. For instance, by a locally devised, simple, inexpensive oil extractor which is still capable of further improvements, we have been able to extract about a pound of oil, from 1,300 peels of oranges at a cost of about Rs. 3/- only excluding the price of peels, which shows that in citrus squash factories, peels alone (which at present are largely discarded) can yield enough oil and Pectin which can more than pay off the price of oranges used for squash making. So it

is in this spirit and on these lines in which the fruit industry is required to be developed.

An enquiry that is most frequently addressed to us is "what are the products for which there is the greatest scope in this country?" An attempt is made to briefly answer this query in the following pages :—

(a) **Fruit Juices.**—The greatest scope lies in the manufacture of fruit juices. India is a tropical country and the need for cold drinks is felt for a greater part of the year. Even in the Punjab we require cold drinks for at least 8 months in the year and in many other provinces of India, cold drinks are needed practically all the year round. If the figures of the amount of aerated waters like orangeade, lemonade, strawberry, etc., as well as various kinds of 'sherbats' and beverages consumed, are collected for the whole country, they will easily amount to several hundred crores of bottles. Most of these contain artificial colour, flavour and saccharine instead of sugar, none of which has any food value. If real fruit juices could be substituted in place of these synthetic preparations, it should prove, on the one hand, a boon to the consumer, and on the other, prosperity to the fruit grower and would also stop a drain of money from India as most of the synthetic products are imported from abroad. There is not the slightest justification for importing orange and lemon squashes or other fruit juices from foreign countries when we have any amount of fruit available here and the products can be manufactured at a fraction of the cost at which the imported products are sold. If the aerated water factories begin to

utilise real fruit juice instead of synthetic colour and flavour in the aerated drinks, this alone can take care of thousands of tons of fruits.—(U.S.A. alone produces about ten crores of gallons of juices a year). Juices, squashes and cordials can be prepared from a variety of fruits like maltas, sangtras, lemons, limes, galgals, jamans, grapes, apples, mangoes, etc., etc. A most refreshing beverage can be prepared from ordinary juicy type of mangoes which practically go to waste in enormous quantities at present in this country. There is no reason why Punjab should not manufacture annually 50 lacs of bottles of various kinds of fruit squashes as the market for the same can be easily developed throughout India.

✓(b) **Tomato products.**—There seems also a great scope for tomato products like tomato juice and tomato ketchup. Medical authorities all over the world are recommending the use of tomato juice both for patients and healthy people, whether children or grown-ups. It is also a most refreshing drink. A bottle of 24 oz. in size (foreign made) was sold in India before the War at about Rs. 1|4/- each which can be actually manufactured in India at a cost of a few annas each. It seems almost an insult to our intelligence that we should be importing tomato juice from outside while our own tomatoes are rotting here in tons and do not fetch, in the glut of the season, even one rupee a maund. Similarly tomato ketchup or puree or "tomatoes in peas or beans and green gram" should also find ready sale in the market.

(c) **Jams, jellies, marmalades and crystallized or candied fruits.**—There

is also good scope for making these products. Most of our common fruits like peaches, plums, guavas, apricots, etc., that are of ordinary quality, are very cheap at the time of ripening but they are quite suitable for the purpose of jams, jellies, etc., and the products made can, therefore, favourably compete with the imported ones both in quality and price. Marmalade from citrus fruits can also be prepared at fairly low cost and can easily and successfully compete with foreign brands. Crystallised and candied fruits are also imported in India in considerable quantity and sell at exorbitant rates. There is also a large quantity already being produced in India. Their preparation is not very difficult, and there is no justification for not manufacturing our full requirements in this country. In our laboratories, *Ziziphus jujubee* and orange peels have been candied by special methods devised by us and the products have been immensely appreciated by all—both Indian and European. They can be prepared at a cost of a few annas a lb. and can easily compete with imported products.

✓(d) **Vinegar.**—A great deal of the fruit that goes to waste at present can be utilized in making vinegar. The cost of making vinegar from some of the fruits hardly comes to a rupee per gallon while we are importing considerable quantity of vinegar from abroad at high price.

✓(e) **Canned vegetables and fruits.**—Canning of vegetables like peas, green gram, beans or tomatoes also offers a reasonable scope. Most of these vegetables can be had at a very low price at certain times of the year but they cannot be had, except at exorbitant rates, after

the season is over. For instance most Indians would welcome a dish of green gram throughout the year in preference to even peas but green grams cannot be had during the year except for a couple of weeks in February. Similarly canning of some fruits like mangoes, pears, peaches, plums, grapes also offers a reasonable scope. Undoubtedly markets will have to be created and developed in India for canned fruits and vegetables as the same are not being used very extensively by Indians at present, mainly because only foreign products are available which are sold at exorbitant rates.

The main consideration for a prospec-

tive manufacturer should be to locate his factory at a place where most kinds of fruits and vegetables can be had throughout the year in order to run the factory and keep the staff employed for the longest period possible.

Information on the methods of manufacture of various products referred to above as well as the machinery required and places from where the same can be had, is given elsewhere in this issue. Further information on any particular topic can be readily obtained by addressing the Fruit Specialist, Punjab, Lyallpur.

Do you know? That bees can increase the yield of your fruit trees ?
And that they can better the *quality* of your fruits ?

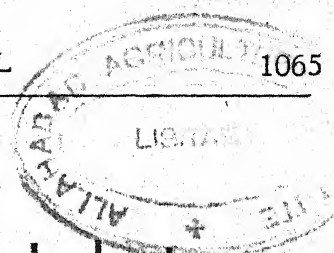
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War and the Preservation Industry

By

K. L. Kohli, M.A., L.S.G.D. (Punjab)

With an hurricane speed, the war is enveloping almost the entire world. With the recent entry of Japan into the struggle the titanic war has well-nigh approached the borders of our country.

Despite the mechanization of the modern warfare, the vast man power of the Allies, is the single decisive factor which would lead towards the ultimate victory of the democracies. Even in this "blitzkrieg" warfare, army marches on its stomach: (as was observed by Napoleon, the great strategist, some three hundred years ago, and in consequence of which the announcement for an award of 12,000 francs by the French authorities for finding a way to preserve foods, led to the scientific origin of the canned food industry.)

In any scheme of the modern defence dietary, supreme importance is now being given to the 'food catalysts' vitamins B1, B2 (G), C, fructose, citric acid and others, which are necessary in building the physical stamina and nerve health of the soldiers. To impress the point the following illuminating abstract from the Canning Age June, 1941, emphasising the medical-cum-military importance of the fruit dietary would not be out of place:—

"The Germans have done more in this field than any other nation. By close attention to vitamins—those spark plugs of the human system—they are increasing the physical stamina and nerve health of their soldiers. Medical men hear reports that the Nazis are making deliberate use of vitamin starvation to reduce the population of the occupied countries to a state of depression and mental weakness that will make them easier to hold in subjec-

tion. The role of thiamin, or Vitamin B1, in building morale has been definitely proved. England has legislated it into white flour to help to build the morale of the people and to prevent illness and the nervous depressions resulting from the bombing and crowded conditions in air-raid shelters. Fatigue is the worst enemy of industry and the military. Anything which materially lessens fatigue among workers, soldiers and sailors is as vital a defence requirement as the weapons they produce and operate.

During periods of pressure, when the individual works at high speed or with the expenditure of great physical energy, the adrenal endocrine glands mobilize hidden reserves. It is their function which enables the aviator to power-dive, athletes to overcome competitors, the keen general to outmanoeuvre his opposition. It is secretion of the hormone adrenin, produced by the adrenal ductless glands, that performs this bio-logical magic. It stimulates the discharge of glycogen from the liver cells, and this in turn provides optimum muscular energy. Under its influence, the energizing blood currents speed to heart, brain, and muscles, amplifying their functions. The deficiency of Vitamins C (cevitamic acid) causes a degeneration of the adrenals, jeopardizing production of the hormone. Daily consumption of canned citrus juices, containing beneficial amounts of this vitamins will help restrain deficiency-induced fatigue. In addition to Vitamin C, fruit juices can offer significant amounts of Vitamins B1, B2 (G), fructose and citric acid, also valuable in amplifying physical energy and reducing fatigue. The catalysis and

alkalinity induced by this chemical group aids the digestive and oxidizing functions."

Under these circumstances the possibilities for expansion of the food preservation here in India are immense, as pointed elsewhere in this issue under the article entitled 'Future of Fruit Preservation Industry'. Sugar, textile and flour-milling plants are being converted into preservation plants. The industry of dehydration of potatoes alone has led to the springing up of a large number of dehydrating plants in certain important parts of Northern India. The Supply Department, so far, has placed orders for 75,67,000 maunds of dehydrated potatoes.

The writing on the wall is clear and he who cares may read it. Now is the high time for the industrial financiers to plan with a foresight to capture the Indian as well as external markets for the canned food industry which has high potentiality for yielding dividends both in these days of war and as a post-war industry. The problems which confront this infant industry are numerous and they need sympathetic handling both by the State and the public. The import difficulties such as arranging requisite exchange shipping etc., have aggravated the problems for procuring requisite machinery for the new additions. The timely efforts of M/s. Metal Box Co. (India) Ltd., Calcutta and other firms in the line, to meet some demands locally, here in India, deserve all praise. But the greatest obstacle is still in regard to the availability of containers both glass jars, and tins at reasonable price. If the Canadian canner gets his cans for eighteen pises, his Indian co-brethren have to pay something like 28 pises, such is the present disparity of the can prices. We reiterate the remedies suggested on this vital subject some years back in the columns of this Journal by the Fruit Specialist, Punjab, which need still closer attention, if the industry is to be developed on any sound basis.

"The Government should come forward to help this industry in one of the following ways:—

(a) The Government should either purchase a tin making plant, run it or lease it on easy terms so that the cans may be supplied at a reasonable cost to the manufacturers of fruit products; (b) either give financial help to the manufacturers of tins or guarantee the purchase of a minimum number of cans which may be supplied to the public at a reasonable price; (c) Similarly in the case of glass containers the Government should subsidize the glass manufacturers to produce the desired kind of glass containers and purchase the same from the manufacturers for supply to the fruit preservers at a reasonable price. It may be mentioned that this subsidy will be needed only in the initial stages of the industry. After some time when the number of glass or tin containers required for the industry becomes fairly large the manufacturers would find it profitable to produce these without further subsidy; (d) if the proposals referred to above regarding the supply of tins and glass jars be not feasible for one reason or another, the least that Government should do is to exempt these containers from import duty and arrange for their carriage from the port to the interior at a nominal cost."

Again it would be a news to the Indian canners that rebate is still given to the canners in Australia on the sugar used in the manufacture of jams that are exported. Could not the authorities here in India see their way to allow exemption from the excise duty on the sugar that is used in the manufacture of fruit products. There is a strong case for this rebate for the simple reason that sugar is one of the main items of expenditure in fruit products, and import duty on raw sugar or excise duty on the country-made sugar is more than import duty on the manufactured fruit products like squashes etc.

NEED FOR AUGMENTING SKILLED TECHNICIANS.

It augurs well that at least in the matter of supply of technicians for this highly complicated industry the Fruit Section of the Punjab Agricultural Department is

playing a leading role by training batches after batches of such technicians to cope with the situation, particularly for the dehydrating industry for which there is very great demand at this moment. Till

the time when such training centres are developed in other parts of the country, industrialists would do well to take advantage of the special facilities provided for training at Lyallpur.

Facilities for Training in Fruit Preservation

The Fruit Specialist, Punjab, offers annually a number of short courses in Fruit Preservation, each of 10 to 15 days' duration, throughout the Punjab. Courses at Lyallpur are given in February, July and August. At places, outside Punjab, they are held wherever there is demand for the same. The courses are open to both ladies and gents, but, separate courses meant exclusively for ladies are also held. In 1940-41 alone no less than 425 men and 345 women took advantage of these courses.

Apart from short courses, advanced course in Fruit Preservation, of 7 months' duration is also given annually at Lyallpur, which starts from about the middle of May. This course is primarily meant to supply trained people to take charge of Fruit Preservation Factories. Students are given very thorough training in every branch of Fruit Preservation—canning of

fruits, and vegetables, manufacture of jams, jellies, marmalades and squashes, vinegar, pickling of vegetables, dehydration of vegetables and fruits etc. Minimum qualification for admission is only F.Sc., with chemistry. But the students generally admitted are graduates, or, those holding higher degrees. Only about half a dozen students are admitted. The advantage of this course is being taken by people from all over India, Ceylon and Assam etc.

Recently, at the instance of the Army Supply Department, special courses for training chemists in dehydration of fruits and vegetables have been started. At present, 6 such courses of one month's duration each, starting from November 20th have been arranged and the class is confined to 12 students only.

Further information about the above courses can be had on application.

KHALSA COLLEGE NURSERY, AMRITSAR

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Particulars from :—

**The Head of the BOTANY DEPARTMENT
Khalsa College, AMRITSAR.**

While replying please mention the Punjab Fruit Journal.

Equipment for a Fruit Preservation Factory

By
Lal Singh, B.Sc. (Hons.),
M.Sc. (Calif.),
Fruit Specialist, Punjab, Lyallpur
and
P. Maya Das, B.Sc. (Agri.),
Fruit Section, Lyallpur.

Enquiries are frequently received from prospective manufacturers of fruit products as to the type and amount of machinery required for canning of fruits and vegetables, manufacturing squashes, and jam making etc., on moderate commercial scale. For fruit preservation there is every type of machinery available in foreign countries, costing from a few hundreds of rupees to a few lacs of rupees, and capable of turning out, a few hundred tins to a few lacs of tins a day. It is consequently difficult to give detailed information about all types of machinery, because equipment must vary according to the out-turn desired. Even in the fruit products laboratories at Lyallpur about Rs. 50,000/- worth of machinery is installed both for experimental purposes and for commercial scale production. For the benefit of those interested we give below

the cost of a canning plant, a juice plant, machinery for jam and jelly, as well as, a dehydrator for drying fruits and vegetables as they exist in the fruit products laboratories, Lyallpur.

Canning Plant.—A tin shed of desired capacity is necessary, cost of which will vary greatly from place to place upon the type of building and material used and which need not be given here. A boiler is needed for supplying steam required for not only canning of fruits and vegetables but also for making jams, jellies, tomato ketchup, etc. A second-hand boiler can be had for Rs. 1,500 or so for this purpose. List of the Canning machinery installed at Lyallpur, having a capacity of about 2,000 tins a day (10 hours working), is given below as well as the firms or agents from whom it was obtained. Pre-war prices are also shown against each item :—

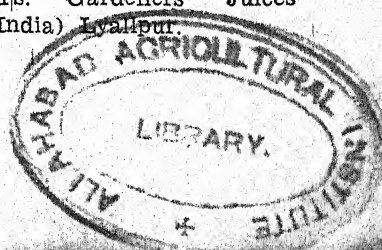
Name of Machine or Article	Year of purchase and price paid.	Name and address of firm or agent from whom obtained.
Syrup tank .. On		
Cooking tank .. One		
Cooling tank .. One		
Pressure cooker for vegetables .. One	Rs. 2,400 (1935)	M/s. Mather & Platt Ltd., Calcutta.
Exhaust Box .. One		
Galvanized iron crates for cans .. 18		
Can reforming unit consisting of :—		
(a) Body reformer .. One		
(b) Flanging Press .. One	Rs. 1,400 (1935)	M/s. Metal Box (India), Ltd., Calcutta.
(c) Double seamer .. One		

Electric motor for canning plant (2.H.P.) .. One	Rs. 271 (1935)	Any reliable make.
Stainless steel knives for Peeling, cutting, coring, pitting and trimming .. 4 doz. each.	Rs. 12 per dozen. (1939)	M/s. Gardeners' Juices (India), Lyallpur.
Vacuum testing gauge for cans .. One	Rs. 55 (1939)	M/s. Metal Box Co., (India) Ltd., Calcutta.
Can testing outfit .. One	Prices variable.	Any reliable make.
Fruit pressure tester and plunger .. One	Prices variable.	Any reliable make.
Enamelled hardware viz. buckets, basins, mugs and sauce pans etc. .. 4 doz. each.	Prices variable.	From any reliable hardware merchant.
Chemical and Physical apparatus viz. burettes, pipettes, thermometers, hydrometer-sets, beakers, funnels, flasks, chemical balances etc. .. as per requirement.	Prices variable.	M/s. Scientific Instrument Co. Ltd., 5, Albert Road, Allahabad. (U.P.)
Weighing scales (240 lbs.) .. One	Prices variable.	Any reliable make.
Pea Podding machine .. One	Rs. 910 (1935)	M/s. Mather & Platt. Ltd., Calcutta.
Cans A2 fruit lacquered (flattened)	Rs. 130 per 1,000	M/s. Metal Box Co. (India) Ltd., Calcutta. 1939-40.
Cans A2½ fruit lacquered (flattened)	Rs. 200 per 1,000	
Cans A2 Plain (flattened)	Rs. 100 per 1,000	
Cans A2½ Plain (flattened)	Rs. 150 per 1,000	

Note:—1. Some of the equipment mentioned above is shown in the Plate on the next page.

2. For home scale production the following machinery is required but this also serves a useful purpose in a commercial factory for odd trials.

Burpee Canning pressure cookers .. Two	Rs. 90 each (1938-39)	M/s. Gardeners' Juices (India) Lyallpur.
Can sealers quick change .. Two	Rs. 90 each (1938-39)	



Juice Plant.—As mentioned in the case of the canning plant the cost etc. of a shed or building for housing the juice plant cannot be discussed owing to the reasons given in the above case.

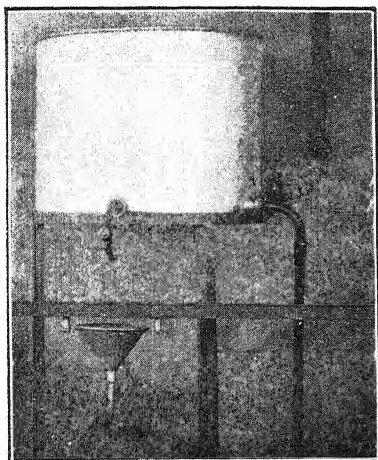
A fairly large amount of equipment required in a juice and squash plant is the same as that for a canning and jam and jelly plant such as steam boiler, steam jacketed kettles, chemical and physical apparatus, enamelled hardware, pasteurizing tanks, weighing machines and peeling and coring knives. These are, therefore,

excluded from the following price list of machinery which is in use in the Fruit Products Laboratories, Lyallpur.

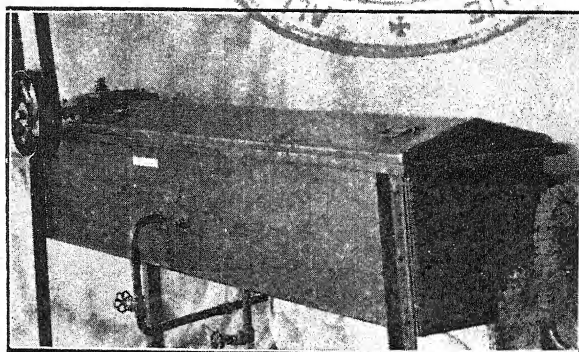
This particular plant is capable of turning out 1,000 bottles of juice of squash per day (10 hours working), but the capacity can be increased by adding more rosing machines as other equipment, like the pulping machine, is capable of higher rate of production :—

A general view of this plant is given in the plate on opposite page.

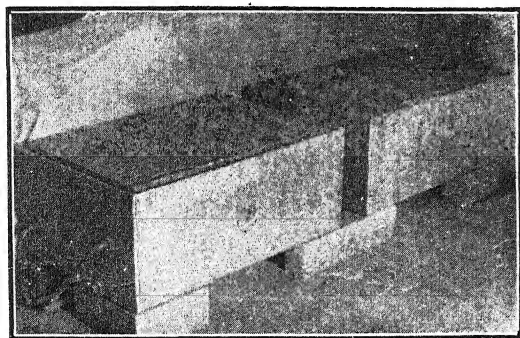
Name of Machine or Article	Year of purchase and price paid.	Name and address of firm or agent from whom obtained.
Rosing machine .. One	Rs. 378 (1939)	M/s. Barnett and Foster, Ltd., Niagra Works, N. I. London.
Pulping machine .. One	Rs. 662 (1939)	
Fruit juice pump with motor .. One	Rs. 2,041 (1939)	
Syrup making tank (glass enamelled) with filter, capacity 50 gallons .. One	Rs. 2,110 (1939)	
Mixing tank (glass enamelled, capacity 50 gallons with bottom agitator) .. One	Rs. 1,260 (1939)	Agents: M/s. Gardeners' Juices (India) Lyallpur.
Syphon-pipe bottle filler, (stainless steel 4 bottle pattern) .. One	Rs. 336 (1939)	
Bottle corking machine .. One	Rs. 210 (1939)	M/s. Farrow and Jackson London and Paris.
Bottle washing machine .. One	F. O. R. Lyallpur. Rs. 290 (1939-40)	
Hydraulic juice press No. 3 by Hollman Co. .. One	Rs. 495 (1935)	Locally made. Agents: M/s. Gardeners' Juices, (India), Lyallpur.
Hand driven grape crusher .. One	Rs. 125 (1929)	
Hand driven apple grater .. One	Rs. 225 (1929)	
Filter press, four chamber pattern .. One	Rs. 150 (1929)	Agents: M/s. Gardeners' Juices (India) Lyallpur.



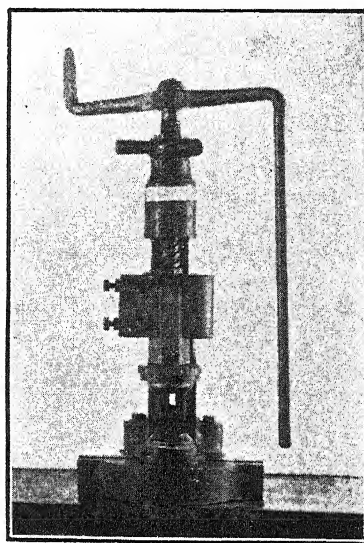
Syruping Tank



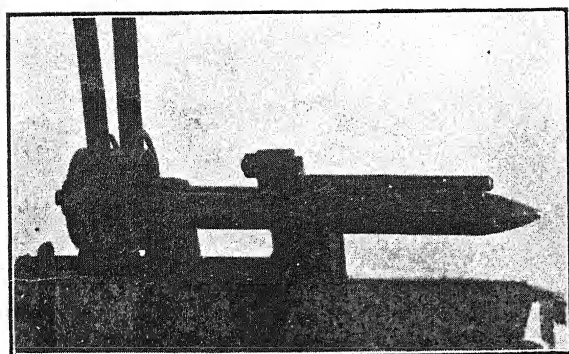
Exhausting Box



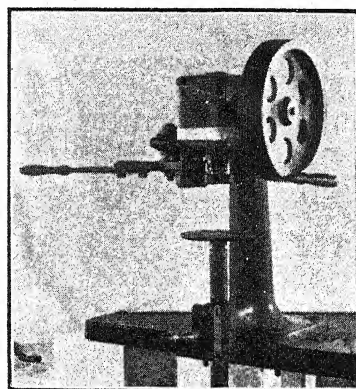
Cooking and Cooling Tanks



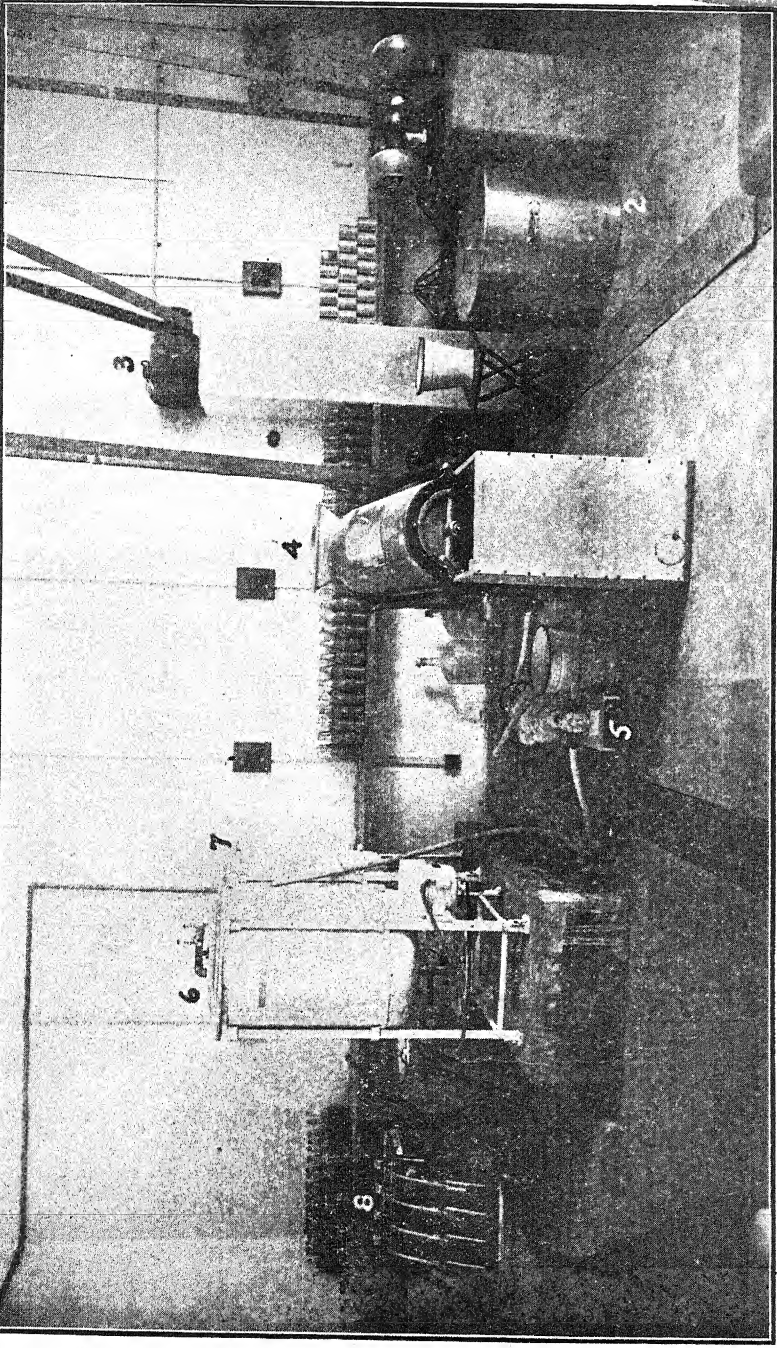
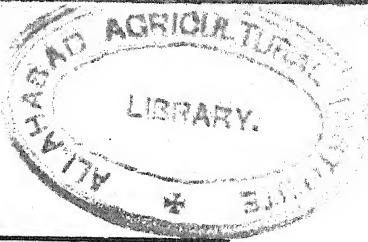
Flanging Press



Body Reformer

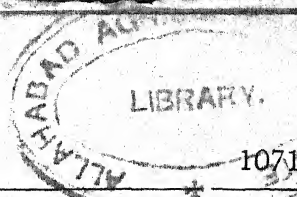


Double Seamer



THE JUICE PLANT

- | | | |
|---------------------|--------------------------|--------------------|
| 1. Rosing Machine. | 2. Stainless Steel Tank. | 3. Electric Motor. |
| 4. Pulping Machine. | 5. Juice Pump. | 6. Mixing Tank. |
| 7. Syrup Tank. | 8. Bottle Filler. | |



Name of Machine or Article	Year of purchase and price paid.	Name and address of firm or agent from whom obtained.
Stainless steel tanks, capacity 50 gallons each (made from stainless steel sheeting gauge 1 1/8 inch) .. 4	Price of sheeting Rs. 40 per maund. (1941-42)	Tanks prepared by the Rolling Mills Co., Chheharta (near Amritsar).
Trolley for carrying 260 bottles.	Rs. 50 (1940)	Made locally.
Bottles glass, empty, for juices and squashes (capacity 26 oz.) as per requirement.	Rs. 2 per dozen. (1939-40)	(i) Victoria Glass Works, Clive Street, Calcutta. (ii) Premier Glass Works, Clive Street, Calcutta.
Carboys glass (capacity 10 gallons) for storing fruit juice .. as per requirement.	Rs. 10 each (1939)	Obtainable from local chemists.
Carboys glass (capacity 4 gallons) for storing fruit juice ... as per requirement.	Rs. 4 each (1939)	Obtainable from local chemists.
Note :— For home scale production the following machinery is required which also serves a useful purpose for conducting laboratory trials in a commercial fruit juice and squash factory.		
Mix Master (Electric juice extractor with accessories) for small scale manufacture .. 2	Rs. 250 each (1938)	Agents : M/s. Gardeners' Juices (India) Lyallpur.
Hand screw juice presses (basket type) for small scale manufacture .. 2	Rs. 90 each (1929)	M/s. Anderson Barngrover Mfg. Co. Ltd., San Francisco, California, U.S.A. Agents : M/s. Gardeners' Juices, (India), Lyallpur. But this can be made locally at lower cost.
Crown corking machines (for small scale manufacture) .. 2	Rs. 90 each (1929)	Agents : M/s. Gardeners' Juices, (India), Lyallpur.
Hand juice extractors (for small scale manufacture) .. 3	Rs. 25 each (1935)	Agents : M/s. Gardeners' Juices, (India), Lyallpur.

Jam, Jelly and Marmalade plant.—As mentioned in the previous two instances, this plant, also, cannot be dealt with here. the cost and type of building, required for Much of the equipment, however, is common to canning and squash making, for

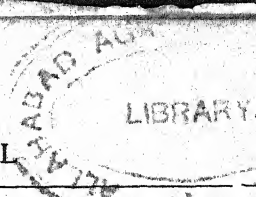
example the steam boiler, peeling and coring equipment, enamelled hardware utensils, chemical and physical apparatus, weighing machine etc., etc.

Steam jacketed kettles and slicing machines are an essential part of the equipment for this plant and these again are used also in juice manufacture i.e. tomato products, like juices and ketchups, as well as, in dehydration.

The jam, jelly and marmalade plant at the fruit products laboratories, Lyallpur has a capacity of turning out about 800 lbs. of jam, jelly or marmalade per day of 10 hour's working. The following list gives the machinery etc., in this plant. Other items of equipment, which come into general use in all the plants, have been omitted.

Pre-war prices and names of firms and agents are also given against each item :—

Name of Article or Machine	Year of purchase and price paid.	Name and address of firm or agent from whom obtained.
Steam jacketed kettle (copper) 10 gallons capacity .. One	Rs. 600 (1929)	M/s. Anderson Barngrover, Mfg. Co. Ltd., 20-22, Fremont Street, San Francisco, California, U. S. A. The Groen Mfg. Co., Chicago, U.S. A. Agents: M/s. Gardeners' Juices (India), Lyallpur. Josiah Anstice and Co., Inc. Rochester, New York.
Steam jacketed kettle (aluminium) (French type) 10 gallons .. One	Rs. 650 (1935)	
Steam jacketed kettle (Monel Metal) 5 gallons capacity .. One	Rs. 895 (1940)	
Slicing machines (Sterling pattern No. 20) .. Two	Rs. 80 each (1935)	Agents: Gardeners' Juices (India), Lyallpur. Agents: M/s. Gardeners' Juices (India), Lyallpur. M/s. Mather and Platt, Ltd., Calcutta. Agents: M/s. Gardeners' Juices (India), Lyallpur. Agents: M/s. Gardeners' Juices (India), Lyallpur. Agents: M/s. Gardeners' Juices (India), Lyallpur.
Slicing machine (Sterling pattern No. 40) .. One	Rs. 285 (1935)	
Combined slicing and Cubing machine .. One	Rs. 200 (1935)	
Marmalade machine (hand worked) .. One	Rs. 280 (1940)	Agents: M/s. Gardeners' Juices (India), Lyallpur. Agents: M/s. Gardeners' Juices (India), Lyallpur. Agents: M/s. Gardeners' Juices (India), Lyallpur.
Steam pipe cooker .. One	Rs. 150	
Jelly thermometer .. One	Rs. 130	
Jelly bags, felt No. 9 .. Six	Rs. 7 each (1937)	Made locally. Agents: M/s. Gardners' Juices (India), Lyallpur.
Wooden ladles .. Six	Price variable.	
Jelmeters .. Two	Rs. 13 each (1940)	
Containers :—		
(a) Glass jars screw cap. 1 lb. .. as per requirement.	Rs. 3 per dozen	Available from local glass Ware Merchants.
(b) Glass jars Suttax (1 lb.) .. as per requirement.	Rs. 3 per dozen.	Available from Suttax Ltd., Gardiner House, 10-14 Charlis, House Street, London, E. C. I.



Name of Machine or Article	Year of purchase and price paid.	Name and address of firm or agent from whom obtained.
Suttax capping machine .. One	Rs. 375 (1939-40)	Available from Suttax Ltd., Gardiner House, 10-14 Charlis House Street, London, E. C. I.

Note :—This machine was purchased under special circumstances. It can only be hired from the above firm at £5|— per annum.

Plant for the dehydration of fruits and vegetables.—Until very recently no adequate plant was known to exist in India for the dehydration of fruits and vegetables on a very large scale.

A plant with an output of at least 1 ton of dry product per day (24 hours continuous working) could be considered adequate for commercial purposes.

The cost of erecting such a plant would be from Rs. 15,000|— to Rs. 20,000|— depending on the local prices of materials, labour etc. This cost includes the following items :—

- (1) Three tunnel dehydrators, recirculation type (28 ft. by 6 ft. by 5 ft.) complete with blow-fan and heating arrangements.
- (2) Twenty four trollies for accommodating 40 trays each.
- (3) 960 Dehydrating trays (2¼ x 2 ft.).
- (4) Trolley track, turn tables etc., etc.
- (5) Equipment for blanching, peeling and slicing.
- (6) Anemometer for measuring the rate of air current in the tunnel.

The dehydrating plant erected at Lyallpur is a very small one and is only meant for experimental work. A detailed account of its working appears elsewhere in this Number.

Equipment for home drying of fruits and vegetables has been in existence at Lyallpur since many years. The equip-

ment is simple and can be made locally at a fairly low cost. It consists of :—

1. Home drier (Gas or coal heated) complete with dehydrating trays.
2. Sulphuring Box, for sulphuring fruits before placing in the drier.

The subject of Home drying of fruits and vegetables is also dealt with separately in another chapter in this Number.

PLANTS FOR SALE

Best Pot-Grown Thin skinned
Mosumbi, Navel-Orange,
Grape-Fruit, Italian Lime and
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Pomelos, Selected Mango-
grafts, Chikoo, Early bearing
Dwarf cocoanut plants etc.

Apply to:—

GARDEN SUPPLIES CO.,

Vile-Parle, BOMBAY.

While replying please mention the Punjab Fruit Journal.

Preparation of Citrus Fruit Squashes and Cordials

By
Lal Singh, B.Sc. (Hons.),
M.Sc. (Calif.),
Fruit Specialist, Punjab, Lyallpur
and
Girdhari Lal, Ph.D. (Lond.), D.I.C.,
Biochemist,
Fruit Products Laboratories,
Lyallpur.

With the recent development of fruit farming in the Punjab plains, the area under citrus fruits has considerably increased and is still increasing at a rapid rate. With this increase in acreage and due to lack of proper marketing organization and transportation facilities, fruit growers all over the province are finding it difficult to dispose of their fruit at very remunerative prices.

For proper development of fruit industry on sound commercial basis, it is highly desirable that fruit preservation be taken in hand individually by big fruit growers as well as on co-operative basis by small fruit growers to convert the surplus or unsaleable but otherwise sound fruit into more profitable and readily saleable products like squashes and cordials for which there is a good demand throughout India during the summer months.

On the basis of analysis of samples of eighteen different brands of citrus squashes available in the market, various sets of squashes of orange (Malta), lemon (imported varieties and galgals) with different sugar concentrations (35°, 45, and 65° balling strength), preserved by different methods of preservation were prepared, and stored at room temperature for

a period of 1½ years. Their behaviour during storage has shown that:—

(1) Citrus fruit squashes with high sugar content (65°B) retain their fresh-fruit character and stability to a marked degree.

(2) Addition of thoroughly ground and strained (through a thick cloth) peel emulsion of one to two per cent fruits used for juice extraction, considerably improves the flavour and aroma of the bottled product. This phenomenon is more marked in squashes with high sugar density, whereas a slightly bitter taste (though palatable) is imparted to the product with low sugar content.

(3) Preservation with sulphur dioxide yields a product superior in taste, flavour and odour to that preserved with sodium benzoate or pasteurization. Sodium benzoate, even in the purest form, imparts a peculiar chemical odour, resembling iodoform, and a burning taste to the product, whereas pasteurized squash develops an unpleasant cooked flavour. Sulphur dioxide imparts a slight sulphurous odour to the freshly prepared product which is not noticeable in the diluted beverage, but this adverse effect disappears after a few months' storage at room temperature.

(4) For effective preservation, maximum permitted concentration of sulphur dioxide (350 parts per million) can be fairly diminished (say 100 to 200 p.p.m.) in squashes with high sugar content. It is convenient to add sulphur dioxide in the form of potassium meta-bisulphite (a salt containing about fifty percent sulphur dioxide).

(5) Pasteurized squash, once opened during summer months, gets spoiled within three to four days, whereas the chemically preserved squash, occasionally opened and recorked in the laboratory, shows no sign of infection even when kept in this condition for over two months.

(6) Sets of squash, other than those preserved with sulphur dioxide, undergo marked colour changes (light yellow to deep brown) in about 1¼ years' storage, whereas the bleaching action of sulphur dioxide seems to avert these adverse colour changes effectively.

(7) Rate of settling of sediment in the Pasteurized squash is much slower than in the chemically preserved squash, colloidal suspension (cloudiness) persists in the former even after one year's storage.

In accordance with results obtained from the above experiments which were conducted in these laboratories under the fruit and vegetable Preservation scheme (I.C.R.) Punjab, the following methods of preparation of these squashes have been evolved:—

Orange Squash:

Step I:—Take fully ripe oranges (Malta), wash thoroughly and cut the fruit into fruits with a Juice extractor (a revolving halves. Extract the Juice from the cut cone) made of non-corridible metal or fruit with a juice extractor (a revolving millimeter mesh sieve and collect it in a non-corridible vessel (an aluminium pan or bucket would do). Hand worked juice extractor i.e., Scooper with revolving Cone is a small piece of machinery which can be purchased at a cost of Rs. 4 to Rs. 5

per extractor. Electrically driven single cone or spindle scoopers can also be used.

Note I:—For extracting the juice on a large scale, desired number of electrically driven cones or scoops can be obtained.

Note 2:—For commercial production, the juice should be strained or passed through pulping machines which can be purchased of any desired capacity.

Step II:—For making squash of medium (about 45° Balling) and high (about 65° Balling) sugar content, weigh out the following amounts of juice, sugar and citric acid as the natural orange juice contains only a small amount of acid (about 0.8 per cent). Citric acid is added to get the desired sugar-acid blend in the finished product, otherwise the palatability and briskness of the diluted squash will suffer considerably:—

(1) Squash with medium sugar content:—

Juice	.. 10 lbs.
Sugar	.. 7 lbs.
Citric acid	.. 3 oz.

(2) Squash with high sugar content:—

Juice	...10 lbs.
Sugar	.. 15½ lbs.
Citric acid	.. 7 oz.

Step III:—Mix the above amounts of juice, sugar and acid. Stir till thoroughly mixed. Add about one ounce of potassium meta-bisulphite per 100 lbs. of the finished product—this is equivalent to about 350 parts of sulphur dioxide per million parts of squash. Potassium meta-bisulphite in the above mentioned dose is a non-injurious chemical, use of which is permissible under Food Laws.

Note:—The amount of sulphur dioxide (350 p.p.m.) given above is the maximum amount permitted for preserving fruit juices. It has, however, been found in this laboratory, that this concentration in expert hands can be fairly diminished (say 100 to 200 p.p.m. of sulphur dioxide) in squashes with high sugar content (65° B) as sugar in this concentration is known to have a strong preservative action. For a lay-man to be on the safe side it is advisable to add the amount of 52° suggested above.

This amount of sulphur dioxide usually imparts an unpleasant sulphurous odour to the product which, however, diminishes with the aging of the product and completely disappears after about 6 to 9 months' storage.

Step IV.—Take peel of 1 to 2 oranges (Maltas) for every 100 fruits used for juice extraction. Thoroughly grind it and strain through a thick cloth. Add the strained peel emulsion to the product as obtained in Step III.

Or

To each gallon (about 12 lbs.) of the product prepared in step III, add the following amount of essence and colour.

1. Essence vita crush extract for orange crush (Barnett & Foster, London)—to 1 fluid $\frac{3}{4}$ oz.

Or

Essence orange crush cloudy 1389 (A Bcake Roberts, London)—1 fluid oz.

2. "Niagara" concentrated orange colour (Barnett & Foster, London)—4 c.c.s. of 4 per cent solution in water.

N.B.—The required amount of essence and colour should just be mixed thoroughly in a little quantity of squash which may then be mixed uniformly with the whole lot.

Step V.—Pour the Squash into sterilized bottles (i.e., which have been previously boiled in water for half an hour); and seal air-tight using sterilized corks. Store the bottles in a cool dry place.

Note.—Orange squash can also be preserved by pasteurization, i.e., by heating the bottles in water at 175°F. for half an hour. By this process the quality of the product is somewhat impaired and the squash must be consumed within 3–4 days after opening the bottles; while this is not the case with product preserved with potassium metabisulphite.

Lemon or lime squash :

Step I.—Take fully ripe European lemons, galgals or sour limes and wash thoroughly. Cut the fruit into halves. Extract the juice from the cut fruit with a juice extractor (a revolving cone used for lemons

and "galgals") or an ordinary lime squeezer (for sour limes). Strain the juice through a two millimeter mesh sieve to incorporate required amount of juice sacs and collect it in a non-corridible vessel (an aluminium pan or bucket would do).

Note 1.—Hand-worked juice extractor or scooper with a revolving cone is a suitable, simple piece of machinery which can be purchased at a cost of Rs. 4–5 per extractor. Electrically driven single cone or spindle scoopers can also be used. For extracting juice on a larger scale, desired number of electrically driven cones or scoops can be obtained.

Note 2.—For commercial production the juice should be strained through pulping machines which can be purchased of any desired output or capacity.

Step II.—For making squash of medium (about 45° Baling) and high (about 85° Baling) sugar content, weigh out the following amounts of juice, sugar and water:

(1) Squash with medium sugar content:—

Juice	.. 1 lb.
Sugar	.. 1 $\frac{1}{4}$ lbs.
Water	.. $\frac{3}{4}$ lb.

(2) Squash with high sugar content:—

Juice	.. 1 lb.
Sugar	.. 2 lb.
Water	.. 3 oz.

Step III.—Mix the above amounts of juice, sugar and water. Stir till thoroughly mixed. In (2), heat the mixture to about 130°F. for dissolving sugar. Add about one ounce of potassium metabisulphite per 100 lbs. of squash (see Step III of Orange Squash).

Note 1.—Fortify the flavour in squash from European lemons and "galgals," separately as follows. No additional flavouring material is acquired in lime squash prepared from *kaghzi lime*.

(i) *Squash from European lemons.* For every 100 fruits, 25 fruits are cut and pressed with the skin in an ordinary basket-press. The juice thus obtained is incorporated in the juice of the rest of the fruits (juice extracted as in Step 1). By this method, appropriate amount of peel oil giving the desired flavour is incorporated in the squash.

(ii) *Squash from "galgals."*—Best way of utilizing "galgal" juice in the preparation of lemon squash is to mix the juice with an equal amount of lime juice. In this manner necessary lime flavour is incorporated in the product, because "galgal" juice alone is entirely devoid of any lime or lemon flavour. In case "galgal" juice alone

is to be employed for making lemon squash then flavour should be fortified by the addition of artificial true lemon flavour at the rate of $\frac{3}{4}$ oz. to 1 oz. per gallon of squash.

Note 2.—See note under Step III in Orange Squash.

Step IV.—Pour the squash into sterilized bottles (i.e., which have been boiled previously in water for half an hour)—after adding a small amount of freshly extracted juice sacs. Seal air-tight using sterilized corks. Store the bottles in a cool and dry place.

Lemon squash can also be preserved by pasteurization as mentioned in the note under Step V in Orange Squash.

Lime Juice cordial:—

Step I.—Take fully ripe sour limes (Kaghzi nimboo), wash thoroughly and cut the fruit into halves. Extract the juice from the cut fruit with an ordinary lime squeezer.

Note.—For large scale production, cutting machines and pressing machines can be obtained.

Step II.—Strain the juice through a thick cloth and collect it in a non-corrosible vessel: (Use glass carboys or wooden barrels for storing larger amounts of juice). Add potassium meta-bisulphite about one ounce per 100 lbs. of juice. Store the juice treated as above in a cool dry place. By this treatment the suspended matter, etc., settles down in about a month's time and a clear sparkling juice is obtained. For quick filtration, special filters can be used.

Step III.—Carefully separate the clear juice from the sediment and for making cordial of medium (about 35° Balling) sugar content, weigh out the following amount of juice, sugar and water:—

(1) Cordial with medium sugar content:—

Juice	1.0 lb.
Sugar	1 $\frac{1}{4}$ lb.
Water	1 lb.

(2) Cordial with high sugar content (about 85B):—

Juice	1.0 lb.
Sugar	2 $\frac{1}{4}$ lb.
Water	3 oz.

(3) Mix the above amounts of juice, sugar and water. Stir till thoroughly mixed. In step III (2) heat the mixture to about 130°F. for dissolving sugar. Add appropriate amount of potassium meta-bisulphite (at the rate given in Step II) for the additional weight of sugar and water added.

Step V.—Pour the cordial in sterilized bottles (i.e., bottles which have been previously boiled in water for half an hour) and seal them air-tight using sterilized corks. Store the product in a cool dry place.

The above investigation has already been published as an article entitled "Studies in the Preservation of fruit juices." (I) "Some observation in the preparation and Preservation of Citrus Fruit Squashes" by Lal Singh and Girdhari Lal in the Indian Journal of Agricultural Science (Vol. VIII, Part I, Feb., 1938) and also as Miscellaneous Bulletin No. 32 of the Imperial Council of Agricultural Research which is a priced publication (price Re. 1/-) and can be had from the Manager of Government Publications, Delhi.

Brief methods of preparation of these Squashes and cordials in non-technical and popular language have also been published as Departmental Leaflets No. 153 and 155.

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Preparation and Preservation of Unfermented Apple Juice

By

Girdhari Lal, Ph.D. (Lond.), D.I.C.
Biochemist, Fruit Products

Laboratories, Lyallpur.

(Detailed investigation on the subject has been published by Imperial Council of Agricultural Research, as a Miscellaneous Bulletin No: 39 entitled "Studies on the Preservation of Fruit Juices." II Experiments on the Preparation of unfermented Apple Juice by Messrs. Lal Singh and Girdhari Lal).

—(Editor).

The utilization of third grade 'cull' apples is already a problem of considerable importance for the fruit growers of Kulu Valley, where due to lack of transport facilities, they are not able to market their third-grade fruit at very remunerative prices. Need has, therefore, been felt for some years past to find cheap and economical methods of utilizing this fruit for some suitable by-product. This problem is likely to assume still greater importance as the acreage under fruits increases in other hilly tracts like Murree and Simla Hills, which being subject to serve attacks of hailstorms, will provide relatively larger proportions of cull fruit. This question must also be of interest to apple growers elsewhere, e.g., Kashmir, Kumaon Hills, etc. Under the existing conditions in our country where alcoholic drinks do not find much favour with the public in general, it is believed that the utilization of surplus 'cull' apples for the production of an unfermented still drink will help the apple growers and also form a profitable undertaking for the manufacturer.

With the above end in view, experiments were conducted at the Fruit Products Laboratories, Lyallpur, under the Fruit and Vegetable Preservation Scheme (I.C.A.R.) on standardizing a method for bottling unfermented apple juice from two varieties of apples, viz., Yellow Newton Pippin and Baldwin which are commonly grown in the Kulu Valley. The following method has been found to give a satisfactory product:—

STEP I.

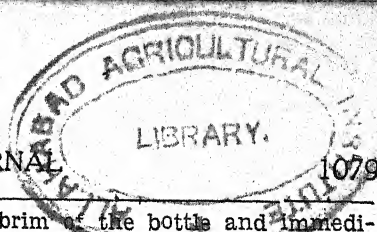
Raw Material.—Use low grade 'cull' fruit (i.e., undersized, oversized, mis-shaped, blemished, sound wind-falls, etc.,) which does not find ready sale in the fresh fruit market. The fruit should have developed full flavour and aroma before use.

STEP II.

Washing.—Give a preliminary washing to the fruit in a weak hydrochloric acid solution (5 gallons of commercial acid in 100 gallons of water) to remove all arsenical and lead spray residues, if any. Wash the fruit thoroughly afterwards to remove the acid and other foreign matter like soil. This is particularly useful in the case of wind-falls.

STEP III.

Crushing.—Crush the fruit in a crusher known as an 'Apple Grater.' The grater can be set to grind the fruit to any desired degree of fineness. Adjustment to get pieces of $1/8$ to $1/2$ inch thick is recommended, as pieces of crushed apples of



this size facilitate the extraction of juice.

Note 1.—Various types of apple graters, for small and large scale production, are illustrated in standard books on the subject. The grater used in these laboratories was obtained a few years ago from Messrs. Anderson Barngrover Mfg. Co., San Francisco, California, U.S.A., at a cost of about Rs. 300/- only and is recommended for small scale manufacturers. This can be manufactured even locally as it is a very simple machine.

STEP IV.

Juice Extraction.—Press the juice out of the crushed mass (placed in a strong cloth) in a basket type, hand worked or hydraulic press. Collect the juice in a non-corrodible vessel preferably made of stainless steel or monel metal. For small scale production even 'aluminium patilas' can be used.

Note 1.—The hydraulic press used in these laboratories was imported from Germany through Messrs. Gardener's Juices (India), Lyallpur at a cost of Rs. 500/- and has a capacity of holding about 200 lbs. of crushed fruit in one charge. For small scale production, a handworked basket type press which can be made locally at a cost of about Rs. 40 (supplied by Messrs. Gardener's Juices, Montgomery Road, Lyallpur) can be used.

STEP V.

Filling and Bottling.—Strain the freshly prepared juice through a thin layer of cotton wool or a very coarse muslin cloth to remove coarse particles of fruit tissues, then bottle the juice by either of the following two methods. (1) Heat the strained juice rapidly to a temperature of 180°—185°F. For commercial production steam-jacketed kettles are recommended. For home scale, heating can be done on direct fire in an aluminium 'patila'. Pour the juice at once at the above temperature (180°—185°F.) into clean sterilized bottles (previously boiled in water for about half an hour) and fill the hot juice till it over-

flows the brim of the bottle and immediately seal air tight with crown corks (previously boiled in water for 2-3 minutes) by an ordinary handworked crown corking machine (costing about rupees 80). It is absolutely essential that temperature of the juice, while filling and sealing as above, should not go below 180°F. in any case. (2) Fill the strained cold juice in sterilized bottle to within about 1" to 1½" of the top depending upon the size of the bottle and seal air tight as above.

Note 1.—Product prepared from the heated juice Step V (1) is better in quality than that prepared from cold juice Step V (2) which is also of a fairly satisfactory quality.

Note 2.—Juice heated in a steam jacketed kettle (Step V (1)) will always give a better product than that heated in an open pan on direct fire, because in the latter case, due to even slight carelessness in heating, the juice coming in contact with the vessel is likely to be burnt and impart a cooked taste to the product. Prolonged heating is avoided as it injures the colour and flavour.

Note 3.—In case clear juice is required, the freshly expressed juice may be clarified by filtragol (for details, please refer to Fruit Specialist, Punjab, Lyallpur). Juice thus clarified will not have as good a taste and flavour as the rough-filtered juice (Step V) but perhaps, due to its attractive appearance and clarity, may have comparatively better marketing possibilities.

Note 4.—For unclarified juice, opaque dark coloured bottles may be preferred, as these mask the unattractive muddy separation of the fruit pulp from the juice.

STEP VI.

Pasteurization.—Place the bottles filled as instructed under Step V (1) horizontally on a removable false bottom of a sterilizer or tank, pan or 'patila' containing water which has been heated to about 175°F., and maintain this temperature for 30 minutes

for bottles of one quart size. Cool the bottles by slowly running cold water into the sterilizer or by removing the bottles from water, taking care that they do not break or crack with cold air; in the case of bottles filled with cold clarified or unclarified juice (Step V (2)) the bottles are horizontally placed in the empty sterilizer which is then covered with water at room temperature. The temperature of water is then raised to 175°F and maintained at that level for 30 minutes.

Note 1.—A rectangular galvanized iron tank of any desired capacity, fitted with a

removable false bottom, can be used as a sterilizer. For working with steam it can be fitted with a perforated pipe placed below the false bottom to serve as a steam inlet. For small scale production for home use, ordinary 'Patilas' can serve the purpose.

STEP VII.

Labelling and Storing.—Remove the cool bottles from the sterilizer, wipe dry, label and store in a cool dry place.

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Preparation of Jam from Pears and Plums

By
Lal Singh, B.Sc. (Hons.),
M.Sc. (Calif.),
Fruit Specialist, Punjab
and
Girdhari Lal, Ph.D. (Lond.), D.I.C.,
Biochemist, Lyallpur.

I. PEAR JAM

In the semi-commercial trials on the canning of Kulu Pears (Williams' variety—method of canning of this variety has already been given in the departmental leaflet No. 154), it was observed that a fair amount of fruit—slightly over-ripe, misshapen, blemished and slightly immature (not properly ripened)—was unfit for canning purposes. This fruit has been successfully utilized for the preparation of jam. The type of "Baghu gosha" pears grown in the Punjab plains are also suitable for the preparation of this product.

The method of preparing the jam as outlined below has been developed under the Fruit and Vegetable Preservation Scheme, Punjab (I. C. A. R.).

Step 1. Preparation of fruit.—Wash the fruit thoroughly in water, peel it carefully with the aid of a special curved knife having a guard which controls the thickness of peel, cut the fruit into two halves through the calyx with a sharp knife, remove the core by a loop shaped corer and slice or cube the fruit in slicer or a cubing machine. (For preparing small lots of jam the fruit can be cut by hand by using a sharp knife). After preparing the fruit in the above manner, immediately submerge it in 1-2 per cent common salt

solution, otherwise rapid discolouration (browning) of the peeled surface takes place.

Step II. Boiling.—Wash off the salt solution from the prepared fruit and put it in a steam-jacketed kettle, add crystalline cane-sugar at the rate of $\frac{3}{4}$ lb. per lb. of pulp and concentrate the mass to a boiling point of 221-222°F. Determine the end point of boiling process by a jam-boiling thermometer which should be dipped in the boiling mass and not allowed to touch the bottom of the pan. Add at the end of the boil 2-3 $\frac{3}{4}$ ozs. of citric acid (the amount of acid used being roughly proportional to the sweetness of fruit) dissolved in a small amount of water for every 100 lbs. of the fruit pulp and mix it thoroughly in the entire mass.

Note 1.—In case the prepared fruit is hard, it is boiled in a small quantity of water prior to the addition of sugar. This treatment will soften the fruit tissue and yield a product of desired consistency.

Note 2.—For small scale production, ordinary aluminium "patilas" can be used and boiling can be carried out on slow fire, care being taken to avoid overheating which can be prevented by constantly shaking the mass with a wooden laddle. An ordinary laboratory thermometer can be used for temperature readings.

Note 3.—Boiling point of 221°F. is given for the Punjab plains (height about 500 feet above sea-level)—concentration to this point corresponding to about 68.0 per cent soluble solids in the finished product (a

figure which is essential to be maintained in the finished jams or jellies). Temperatures corresponding to 68.0 per cent soluble solids at various altitudes above sea-level are given below:—

Altitude in ft.	Sea level	500	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000
Temperature F°.	222°2	221°4	220°4	219°4	218°5	217°6	216°6	215°6	214°7	213°8	212°8

Note—For every 50° ft. rise in altitude a decrease of about 1° in temperature is affected.

Step III. Filling, storing, etc.—Fill the jam while hot (180°—190°F.) in previously sterilized glass jars or cans (preferably lacquered) and seal them air tight. Place the cans or jars while they are still hot, in an inverted position for 5—10 minutes, so that hot jam comes in contact with the inside of the seal and sterilizes it. Label the containers when cold and store in a cool dry place.

II. PLUM JAM

Plums are fairly cheap in the Punjab markets in summer months and can be profitably utilized for the preparation of jam. The following method which has been developed under the Fruit and Vegetable Preservation Scheme of I. C. A. R. has been found to give an excellent product. Red plums give a comparatively better product than the yellow variety.

Step I. Preparation of Fruit.—Discard rotten fruits and then thoroughly wash the plums.

Step II. Extraction of fruit pulp.—Add half a lb. of water and $\frac{3}{4}$ oz. fluid of lemon or lime juice per each lb. of fruit and boil in a steam-jacketed kettle for 15—20 minutes, crush the tender fruit with a wooden laddle.

In case of stoneless product, screen the boiled mass through 1.0 m. m. sieve (preferably of monel metal) while for the product including stones (skin also inclu-

ded) the boiled mass is used as such in the preparation of jam.

Step III. Determination of the amount of sugar required.—In both the cases mentioned in Step II, small amounts of pulpy mass are strained through cloth. The strained juice extract (allowed to cool down to room temperature) is used for the determination of the amount of sugar required to be added, by the aid of a Jelmeter.

Note 1.—Jelmeter invented by Professor Baker of Delaware University (U.S.A.) is a simple device consisting of an ordinary glass tube (4" long) of 6.0 m.m. diameter fused to a piece of capillary tube (2.8" long). The piece of the ordinary tube (4.0" long as mentioned above) has graduation marks for the amount of sugar required for a fruit juice extract to get the standard set for a jam or jelly. The jelmeter is held in hand and filled (brimful) with the juice extract (step III) by pouring the juice at the wider end of the jelmeter and placing a finger under the narrow end. The extract is then allowed to flow or drip for exactly one minute and then replacing finger, the nearest graduation mark against the level of the juice is noted. This reading shows lbs. of sugar to be added for each lb. of pulp for the preparation of a jelly. In the preparation of jams, 4 ozs. of sugar are added in excess to the jelmeter reading. In case the level of juice extract does not flow

below the top mark on the jelmeter (It means the juice extract is too rich in pectin), the extract may be diluted with water to get a reading on the jelmeter scale; and if the juice extract flows below the bottom mark on the jelmeter, (it means that the extract is poor in pectin), the juice extract may be concentrated or appropriate amount of pectin (in liquid or powder form) may be added to get the desired reading.

Note 2.—Jelmeter is an inexpensive apparatus (costing about Rs. 9/- only) and can be used with advantage in the prepara-

tion of jams and jellies, but in case it is not available, for production of jam for home-consumption, 1 lb. to 1¼ lb. of sugar can be added per lb. of fruit pulp as prepared under Step II.

Step IV. Boiling.—Add the amount of sugar as determined under Step III (usually 1 to 1¼ lb. of sugar is required per lb. of pulp in the case of red plums) to the mass in the steam-jacketed kettles (see Step II) and finish the boiling as instructed under pear jam (Step II).

Step V. Filling and Storing.—The same as under pear jam (Step III).

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Jams, Jellies and Marmalades from Punjab Fruits

By
Lal Singh, B.Sc. Hons.),
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Fruit Specialist, Punjab, Lyallpur
and
Girdhari Lal, Ph.D. (Lond.), D.I.C.,
Fruit Biochemist, Lyallpur.

India imports jams and jellies worth about six to seven lakhs of rupees annually. In addition to this, fairly large quantities of local products (home-made or commercial) are consumed. Demand for such products can still further be increased if the available resources of the country, viz. cheap fruit (third-grade cull fruit unfit for table purposes), cheap labour, etc., are utilized. These potentialities, coupled with an up-to-date knowledge (seriously lacking at present) in the technique of all aspects of fruit and vegetable preservation could give a great impetus to this industry. Admittedly, therefore, at this stage, the technical side of this subject requires attention.

It is gratifying to note that the systematic work on the standardization of different kinds of fruit and vegetable products, which has been in progress in the Punjab since 1934, has contributed a good deal towards the solution of this problem. Observations recorded in the preparation of jams, jellies and marmalades from some Punjab fruits (pears, plums, guavas, citrus fruits like oranges,

sangtras, etc.) form a part of the work in hand.

What is a good jelly or marmalade?
—A perfect fruit jelly should be sparkling, transparent and attractive in colour, and should have a strong flavour of the original fruit. It should not be gummy, sticky or syrupy and when cut with a knife it should have a sharp edge, and a clear cut surface. A jelly may be thick-set or soft-set. Any of the above types of jellies in which pieces of fruit are suspended is called a marmalade. The term marmalade, in this country, is usually associated with a product made from fruits like oranges and lemons. In this case, the suspension in the jelly is the shredded peels of these fruits.

Jelly-making consists of boiling a clear fruit juice extract with an adequate quantity of sugar to such a stage that when allowed to cool, it will form a jelly.

These principles, as given below, also apply to the making of marmalade.

Fruit jellies are made from fruit juices which consist chiefly of water in which

Indo-Pakistani

are dissolved small amounts of naturally occurring substances like sugars, acids, pectins, proteins, flavouring material, etc. Sugar must always be added as its natural occurrence is not sufficient to make a jelly. Some fruit juices are deficient in either pectin or acid, or in both, and in such cases, a correct balance of these for jelly-making has to be obtained by adding one or both of these ingredients in definite proportions to obtain a good fruit jelly.

① **Occurrence of Pectin in Fruit.**—Pectin, as mentioned above, occurs naturally in practically all fruits. Its quantity, however, varies with different kinds and even with different varieties of the same fruit. The largest amount of pectin occurs when a fruit has attained its full size and is reaching maturity—a stage just preceding the eating ripe stage. This type of fruit should be used for jelly-making. Pectin content of fruits also increases during dry seasons and is less during moist weather.

By boiling the fruit in adequate quantity of water, the pectin comes out from the fruit tissues in which it is held. All the above factors should be carefully considered before selecting fruit for jelly-making.

Fruits deficient in acid, as a rule, do not make good jellies. In such cases a little lemon or lime (kaghzi-nimboo) juice, citric acid or tartaric acid must be added. Sufficient acid, in either of the above forms, should be added to give the juice a sourness roughly the same as in sour apples. Addition of one to two pounds of lemon or lime juice, or one to two ounces of citric or tartaric acid (preferably citric acid) per 100 lb. of

juice extract (low acidity) will give the desired acidity.

Method of jelly-making.—All firm fruits should be cut into thin slices, covered with water, and boiled in covered kettles or saucepans preferably of aluminium. For home production cooking may be done on open fire, but for semi-commercial or commercial production double-jacketed steam kettles should be used. These kettles are available in varying sizes and are made of copper, aluminium, monel* metal or stainless steel (for jams and jellies copper should be avoided). Inside the double jacket, a coiled steam pipe is fitted, one end of which is attached to the steam feed (40-80 lb. pressure) and the other is fitted with a safety valve to permit steam to escape in case of excessive pressure. These kettles ensure regular heating and avoid cooked or burnt flavours in the product.

The fruit should be boiled just enough to soften it. When the fruit becomes soft enough, the whole mass is placed in a jelly bag or double layer of cheese cloth or any other suitable thick cloth and the clear extract allowed to drip. The juice must on no account be forced out by pressing. The first extract always gives a product of good quality, but the general practice is to add more water to the residue and boil for a short period to extract more pectin. This may be mixed with the first extract.

② **Addition of Sugar.**—To avoid scum-forming during cooking (see below) which, unless removed, impairs the clarity of the jelly, only the best quality crystalline sugar should be used. Too

*A non-corrodible alloy of nickel, copper, manganese, etc.

binds the cells

*- Pectin → jelly formation in the substance. Protoplasmic
it present in a ready stage. Pectin changes to water
② - acid → makes cellular phenomena
fiber become elastic and water tight. Some*

much sugar is liable to produce a syrupy jelly and may even result in crystallization; on the other hand, an insufficient quantity of sugar sometimes gives a tough jelly. The amount of sugar required to make a good jelly depends upon the quantity of pectin and acid present in the juice, the former being more important.

To ascertain the quantity of pectin present in the juice extract, two tests are generally employed.

Alcohol test.—Take a teaspoonful of cooled juice in a small glass tumbler or a beaker and add to it two teaspoonfuls of methylated spirit, shake gently and allow it to stand for a while. Pour out the mixture on to a plate and note the size of clots it drops in. These clots indicate the amount of pectin present.

(i) A number of small clots indicate pectin present in small quantities and sugar added should be half a cup or half a pound for every cup or pound of juice extract. It is, however, advisable in some cases to concentrate the juice to increase the pectin content.

(ii) When two or three cloths are formed, $\frac{3}{4}$ cup or $\frac{3}{4}$ lb. sugar should be added for every cup or pound of juice extract.

(iii) If only one large clot is formed it indicates that the juice is rich in pectin and an equal measure or weight of sugar should be added.

Jelmeter test.—The jelmeter recently invented by Professor Baker of Delaware University (U. S. A.) is a very handy and simple device (costing about Rs. 9) and is now commonly

used for determining the right amount of sugar for making jams and jellies. The test applied by this instrument is more accurate than the alcohol method. The method of using this instrument is briefly described below.

Hold the jelmeter in upright position in the hand, closing the narrow end with the little finger. Pour the cooled juice extract into the jelmeter through its wider end and fill it to the top (brimful). Remove finger from the bottom and let the extract flow or drip exactly for one minute, replace the finger and note the nearest graduation mark on the jelmeter where the level of the juice stands. This reading shows the cup or pound of sugar to be added for each cup or pound of juice extract.

For jams, 4 oz. of sugar is added in excess to the jelmeter reading for every pound of juice extract.

In case the juice extract is very rich in pectin and the level, after the test, does not go below the uppermost mark of the jelmeter, the juice extract may be diluted slightly. If, however, the extract is very poor in pectin and flows below the bottom mark, it should either be concentrated by further boiling, or powdered or liquid pectin should be added to get a suitable reading on the jelmeter.

Cooking or Boiling.—Put the strained juice in an open pan preferably of aluminium (for large-scale production use steam-jacketed kettles) and add the requisite amount of sugar (as determined by the above tests) and heat the mixture to boiling point. Strain it hot through a double layer of thick cloth or preferably a felt bag, to remove sugar impurities. Replace and boil again, removing any

scum that may appear. Cook until any of the following tests are obtained.

Sheeting test.—Take up a little of the boiling mixture in a ladle, allow it to cool a little and let it drip. If the jelly flows down in thick drops more cooking is required but if it drops in flakes the jelly has reached the final stage.

Drop test.—A drop of the boiling mixture is placed on a cold china plate from time to time and the condition of the drop by experience indicates the finishing point. This test is not so rapid and accurate as the above test.

Temperature control test.—If correct proportions of sugar, acid and pectin are used, then a proper jelly will be formed when the mixture reads 222°F. at sea-level, i.e. further cooking should cease when the above temperature is reached. This temperature, i.e. 222°F., may be decreased by 1° for every 500 ft. rise in the altitude from the sea-level of the place where the jelly is prepared. For instance, at an elevation of 2,000 ft. above sea-level, the cooking should cease when the temperature of 218°F. is reached.

For home production, an ordinary but accurate Fahrenheit thermometer can be used, but for large-scale production where boiling is done in steam-jacketed kettles, a special jelly thermometer should be used on this. The operator can read the temperature while standing at a distance from the boiling pan.

Weight method.—In the case of jellies, after making the jelmeter test, as directed above, weigh the juice extract and add sugar as shown in Table I; cook

until the weight indicated for jellies in Table I is obtained. Directions for cooking jams are the same as for jellies but the amount of sugar to add is increased. In this case, cook to weight as shown for jams in Table I.

TABLE I
Cooking weight of jams and jellies

Jelmeter test figures on nearest line	Sugar to add for each lb. of juice extract		Cook to weight	
	Jellies		Jams	
	lb. oz.	lb. oz.	lb. oz.	lb. oz.
1½	1 4	1 8	2 0	2 6
1	1 0	1 4	1 10	0
¾	0 12	1 0	1 4	1 10
½	0 8	0 12	0 14	1 4

The weight method is generally used for home-scale production when a jam or jelly is cooked in a kettle or pan placed on direct fire. The kettle or pan is weighed by means of a spring balance or any other convenient scale; known weight of juice extract and sugar are put and cooking is stopped when the weight (which can be calculated from Table I in accordance with the quantity handled) indicated for jams and jellies in Table I is obtained.

Filling and Sealing.—For production on home scale, pour the jelly or marmalade, while hot, into dry sterilized jars (previously heated in boiling water for about half an hour) or in dry tin cans previously rinsed with hot water. Allow the contents to cool overnight, keeping them covered with a piece of clean paper or cloth. When cool, a thin layer of hot melting paraffin wax or a piece of

butter paper dipped in alcohol or brandy may be put over the surface of the contents after which the containers are sealed. The lids of the jars are fixed in position and lids of the cans are sealed with a can sealer, and the product is stored in a cool dry place. For production on a commercial scale, pour the jelly scalding hot in jars or tins and seal airtight immediately. If jellies made from red-coloured fruits are filled in tin cans, the inside of the can should be heavily lacquered to prevent bleaching of colour.

Jam-making.—Ordinarily, fruits unfit for fresh market or canning, such as those damaged by hail-storms, blemished or slightly over-ripe or under-ripe, etc. are used for jam-making.

Soft fruits like berries may be washed. Stone fruits can be made into jam with or without stones. Hard fruits should be softened by boiling.

Consistency of jam may or may not be jelly-like, but it is always desirable to have jam which sets like a jelly and in such cases a small amount of juice of the fruit used is extracted and the pectin test applied to that juice.

To determine the final consistency in a jam, it is not possible to apply the sheeting test, and therefore the temperature control method or the weight method should be applied. For home production jam may be filled in containers and sealed in the manner as described for jellies. In commercial practice, however, the product is poured, while hot, into jars or cans and immediately sealed. The filled jars or cans are then placed in an inverted position

for 5-10 minutes, so that the hot jam comes into contact with the inside of the cover and sterilizes it. The containers, when quite cold, are stored in a cool, dry place.

Recipes.—The product prepared from the recipes given below has been tested during two years' storage and found to be excellent.

Citrus marmalades.—Marmalade comparing very favourably with any of the imported brands can be made from the following fruits with the following combinations:

- (a) Malta orange and **khatta** (*Citrus aurantium*) 2: 1 by weight (Peel shreds of Malta oranges.)
- (b) **Sangtra** and **khatta** 2: 1 by weight (Peel shreds of sangtra oranges.)
- (c) **Khatta** alone (Peel shreds of Malta oranges.)
- (d) Malta orange and **galgal** (*Citrus limonia*) 2: 1 by weight (Peel shreds of Malta oranges.)

The product is likely to become dark in about 6 months' storage.

Wash fruit, and with a sharp knife remove only the upper yellow portion of the skin (except sangtras which can be peeled by hand), leaving as much of the white portion of the peel on the fruit as possible (for making peel shreds see below). Cut the fruit into thin slices, add water just enough to cover the sliced fruit and boil for about an hour to extract pectin. Follow the directions

as given for jellies, viz. strain the juice, add correct amount of sugar (it is advisable to boil the juice and strain once again before adding sugar), cook, add peel shreds which should be prepared beforehand and boil until jelly with peel suspensions is ready.

To prevent darkening of marmalade in storage, allow it to cool a little, and add potassium meta-bisulphite dissolved in a small amount of water at the rate of 4 gm. (about one drachm) per 100 lb. of the finished product. This should not be done if the marmalade is to be filled in cans.

Cut the peels of the fruit into thin or thick slices as desired, about 1 to 1½" long, with a sharp knife or a hand-worked slicing machine (for commercial production power-driven slicers can be used). To remove bitterness of the peel, boil these shreds in water for 10-15 minutes, discard the water extract and boil again in water for 5-10 minutes. Add the shreds at the rate of one ounce to one pound of original juice extract, to the boiling jelly, when a temperature of 218°F. (at sea-level) is reached. Unless added in the above manner, the shreds may not remain evenly suspended in the finished marmalade. After the marmalade is poured in the glass jar or tin, it may be desirable to stir the contents with a glass rod or spoon to spread evenly the shreds in the whole mass.

✓ **Guava jelly.**—For this product fresh, slightly under-ripe fruit is the best. Wash fruit, discard damaged portions, cut into slices, add an equal quantity of water and ¾ fluid oz. of lemon juice per lb. of fruit. Boil for half an hour (instead of lemon juice, about ½ to 1

fluid drachm of citric acid solution prepared by dissolving one pound of citric acid in one pint of water can also be used). For the rest of the process, see general directions for jelly-making.

The above method can also be used for the preparation of apple and plum jelly. For plum jelly, however, pits are discarded. The quantities of lemon juice or citric acid solution can be varied according to the tartness or otherwise of the fruit. In case apples and plums are already tart enough, acid need not be added.

✓ **Pear jam.**—Wash fruit, discard damaged parts, remove peels and cores. While peeling keep the peeled and cored fruit in 1 to 2 per cent brine (common salt solution) to avoid browning. Cut the prepared fruit into thin slices, add sugar at ¾ lb. to one lb. of fruit and cook as for jams. When near the final stage, add 2 to 3¾ oz. citric acid dissolved in a small amount of water for every 100 lb. of the fruit pulp and thoroughly mix. Fill the jam in jars or cans as directed above.

Plum jam.—(with or without stones). Red plums are the best. Wash fruit, discard rotten or damaged fruits, wash and remove pits if a stoneless product is required, add ½ lb. water and ¾ fluid oz. of lemon juice per lb. of fruit and boil for 15 min. For the rest of the process, see directions for jam-making.

(Reproduced from the Indian Farming Vol. 11, No. 4, April 1941.)

Note:—Detailed methods for the manufacture of Pear jam and Plum jam are given elsewhere in this issue.

✓ Tomato Ketchup

By

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and

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The tomato, as a fresh vegetable, has a most refreshing and appetizing flavour and is held in high esteem by great many people in this country. From the point of view of human nutrition, the importance of tomato lies in its richness in vitamins, particularly antiscorbutic vitamin C. It is on this account that it is considered a prize vegetable in Western countries and extensively used in homes in fresh condition. It is also used in the preparation of various food products. In these countries, particularly in America, tomatoes are grown on a very large scale—most of the crop being used by canneries for canning and manufacturing products like puree, ketchup, sauce, etc., for home consumption as well as overseas export. The tomato products industry has developed to such an extent in America that at present it is supplying these products to the world market.

Tomatoes in the Punjab are specially prolific in April, May and June and are also available in November and December, if protected from frost. From May to the middle of June, they are found in great abundance and can be purchased at extremely low prices of annas 12 to Re. 1 per maund (82 lbs.) in the important markets of the Punjab (Lahore, Amritsar, Jullundur, etc.). With such plentiful resources and potentialities (cheap raw material coupled with cheap labour), if proper ways and means are exploited, and the

tomato products industry organised on proper scientific lines, a very flourishing industry could be warranted.

On the basis of the experimental work conducted in these Laboratories under the Fruit and Vegetable Preservation scheme, Punjab (I.C.A.R.), the following method has been evolved for the preparation of tomato ketchup.

1. Preparation of Raw material.—Select clean, sound tomatoes of an intense red colour and thoroughly wash them to remove dirt, soft rot, etc. Unripe tomatoes, if employed, will yield a product of poor quality. Carefully trim off all green portions of partially ripe tomatoes, and remove stalks, decayed portions and cracks.

2. Pulping and Screening.—Crush the sorted and trimmed tomatoes by passing them through a crusher consisting of two revolving, adjustable, grooved wooden rollers placed horizontally. Boil the crushed mass (seeds, skin and juice) in a steam-jacketed kettle (see 4. below) for about five minutes; pass it through a sieve of one millimeter mesh (preferably of nickel) covered with a thin muslin cloth.

For Commercial production, the boiled crushed mass should be strained through pulping machines (preferably of stainless steel). Such machines can be purchased from foreign countries; and one such machine of fairly large capacity exists in these laboratories.

3. **Recipe.**—Measure the volume of the pulp and weigh out the following amounts of spices, sugar, etc., for every 8 gallons of pulp, as obtained in paragraph 2 above.

Ingredient	Approximate amount.
(1) Onions (Chopped)	7 chhatanks.
(2) Garlic (Chopped)	2½ tolas.
(3) Cloves (whole)	1 tola.
(4) Spices (whole) Cardomom. Black pepper, Zira in equal quantities.	1 tola.
(5) Mace (jalvatri) not ground	¼ tola.
(6) Cinnamon	1½ tola.
(7) Vinegar	1¼ seers.
(8) Sugar	1 seer.
(9) Salt	5¾ chhatanks.
(10) Red chillies	1 tola.

4. **Cooking.**—The mode of concentrating the pulp greatly affects the quality of the product. If the pulp is heated on an open fire, the prolonged heating and high temperature adversely affect the quality of the product, whilst the direct heat of the fire may also impart a cooked flavour to it. On the other hand, if cooking is done in steam-jacketed kettles (see below) at

a high steam pressure, the rapid and brisk boiling which occurs, helps in the retention of a bright red colour and a fresh flavour. In order to obtain a product of superior quality it is, therefore, advisable that the cooking should be done in steam-jacketed kettles. These kettles, which can be had of any desired capacity, are made of copper or aluminium, and are circular in shape. They are enclosed, to a certain depth, in an outer closed jacket having a coil running through it—one end of the coil is connected to a steam feed (steam at 40 to 80 lbs. pressure) from a boiler, and a safety valve is fitted on the other end to allow the steam to escape when it rises beyond a certain pressure.

Put the pulp as obtained in 2 above in the steam pan along with onions, garlic and spices (all loosely tied in a cloth bag) and bring the mass to a quick boil. Brisk foaming will occur and may be controlled by the addition of a small quantity of butter. Add about 1/3rd of this prescribed quantity of sugar before boiling and the remainder about the middle of the cooking process. Add vinegar about five minutes before the end of the cooking process. Cut off the steam, add salt and thoroughly mix it in the entire mass. Remove the bag of spices from the finished product.

NOTE.—1. The product will be of the desired consistency if the pulp in the above process had been boiled down to about one-third of its original volume.

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NOTE —2. The addition of spices or condiments directly to the pulp should be avoided as this tends to darken the colour of the finished product whilst the presence of condiments in the finished product imparts an unattractive appearance.

5. **Bottling.**—As soon as the cooking is finished, pour the product into hot sterilized bottles which have been washed, and boiled in water for about half an hour previously. If possible, use hexagonal shaped crown-cork bottles. Seal the bottles with sterilized crown-corks by means of a crown-corking machine. Place these bottles immediately in a horizontal position in a vessel of hot water and keep the water boiling for 30 minutes in order to sterilize the product thoroughly. To prevent the breakage of bottles during sterilization, it is necessary to have a rack or false bottom on which the bottles may be placed to avoid direct heat.

It may be emphasized here that sterilization is the most important operation

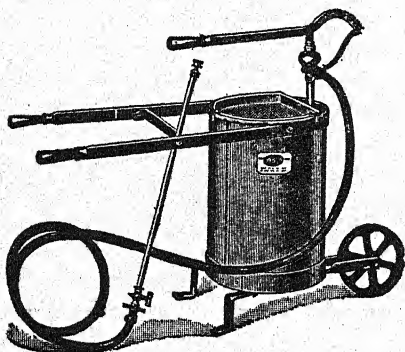
and a little carelessness in this step will spoil the product. If properly sterilized, ketchup will remain sound for a long period, but incompletely sterilized material will begin to decay within a few days.

It may be noted that ketchup can also be successfully preserved by the addition of 0.1 per cent. sodium benzoate. Ketchup thus preserved need not be sterilized.

Label the bottles and keep them in a cool dry place. So long as the cork remains intact and air-tight the product will remain in good condition.

Detailed investigation on this product has already been published as Miscellaneous Bulletin No. 31 of the Imperial Council of Agricultural Research entitled "An investigation on the Methods of Preparation and Standardization of Tomato Ketchup," by Lal Singh and Girdhari Lal which is a priced publication and can be had from the Manager Publications, Delhi, at a cost of As. 7.

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Tomato Juice

By

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(Reproduced from the Punjab Fruit Journal Vol. I, No. 3. This has also been published as a popular leaflet No. 162 by the Department of Agriculture, Punjab.)

Quite recently, the production of canned tomato juice has considerably increased in foreign countries and a fair amount of this product is now found in the Indian market. The dietetic value of tomato products is considerably enhanced by the presence of a large amount of Vitamins in fresh tomatoes. Vitamins, in general, are known to be adversely affected by the application of heat, but since the least amount of heat is applied (see below) in preparing tomato juice, it is believed that the deleterious effect on its Vitamin content may be very limited. Investigation into this aspect will be undertaken as soon as time and facilities permit.

As in our Province, tomatoes can be had very cheap during the season (April, May and June), it was realized that such fruit could be very profitably utilized besides other products for the preparation of tomato juice—a very delicious and healthful drink.

Experiments:—In order to see the standard of composition maintained by foreign packers of tomato-juice, a few samples were analysed with the following result:—

Percentage of solids in pulp at 68°F. 5.66. Specific gravity at 68°F. 1.0240. Percentage of common salt (Sodium Chloride) 0.89. Acid (as citric acid) 0.38%p.

In summer 1935, experiments on two varieties of tomatoes, locally known as 'Desi' (fruit flat, round and of irregular shape); and 'Peshawari' (fruit rather oval, small and of regular shape) were conducted and the juice obtained from these two varieties under different methods of extraction, dilution, etc., after addition of an appropriate amount of common salt, were separately preserved with 0.1 per cent sodium benzoate and also pasteurized at 212°F. (boiling water) for half an hour.

The results of these experiments have shown that all sets of juice preserved with sodium benzoate were spoiled within a week of canning, whereas no spoilage occurred in the pasteurized juice. During storage for the last one year, the pasteurized juice has retained fresh tomato flavour to a marked degree, the 'Peshawari' variety yielding a relatively better quality product than the 'Desi'. During this season, packing of juice has been very satisfactorily done in bottles instead of cans.

Method of Preparation and Preservation:—

Step 1.—Take fully ripe, red-coloured tomatoes, wash thoroughly and trim carefully green and rotten portions.

Step 2.—For work on a larger scale, crush the sorted and trimmed tomatoes by passing them through a crusher, consisting of two revolving, adjustable, grooved wooden rollers placed horizontally. Smaller lots of tomatoes can be crushed with a wooden ladle in a non-corrodible vessel.

Boil the crushed mass in a steam-jacketed kettle (see note below) for 3 to 5 minutes (for work on a home-scale, open vessel on direct heat may be employed), pass it through a sieve of one millimeter mesh, (preferably of nickel or monel metal) covered with a thin muslin cloth, (for work on a commercial scale, special pulping and straining machines can be purchased).

Note:—For rapid heating and to avoid high temperatures for a long time, (which adversely affect the colour and quality of the product) special steam-jacketed kettles are used. These kettles which can be had of any desired capacity, are made of copper, aluminium, monel metal or stainless steel, and are circular in shape. They are enclosed, to a certain depth, in an outer closed-jacket having a coil running through it— one end of the coil is connected to a steam feed (steam at 40 to 80 lbs. pressure) from a boiler and a safety valve is fitted on the other to allow the steam to escape when the pressure rises above a certain limit.

Step 3.—Put the strained pulp (seeds and skin removed) in the steam-jacketed kettle or in an open pan on direct heat for smaller lots, and just bring the mass to a quick boil (avoid overheating in the case of direct heat), and cut off the steam or remove the direct heat as the case may be.

Note:—If the right type of raw material is used, the above process yields a product of the right consistency, but in case slightly over-ripe fruit is used, the juice obtained may be too thick, in which case it is diluted with an appropriate amount of water (only a very small amount of water is required to be added), so that the finished product contains about 6.0 per cent solids. Solids in the pulp can be determined by a specific gravity determination.

Determination of Total Solids:—Strain the juice through a thick cloth and determine the specific gravity of the strained

juice at 68°F. by a hydrometer. Read the percentage of total solids in the pulp corresponding to the observed specific gravity from the tables given in text-books on the subject.

Step 4.—Add common salt at the rate of one part by weight per 100 parts of juice. Pour the juice while hot in sterilized bottles (i.e., bottles which have been previously boiled in water for half an hour) and seal them air-tight. Place these bottles in a vessel having a false bottom, cover the bottles with water which may be kept boiling for half an hour. Remove the bottles and place them in a cool dry place. The product can also be packed in cans, for which purpose a special equipment can be obtained which is rather expensive for home-scale production.

Note:—It may be pointed out that in this country where fruit preservation industry is still in its infancy and people are rather suspicious about the contents of tins (these being not visible), it is advisable that new products, like tomato juice, should be introduced into the market in glass containers as the contents will be visible to the consumer and he will know what he is buying.

The above method has been evolved under the fruit and vegetable preservation scheme in the Punjab, financed by the Imperial Council of Agricultural Research.

Note:—The product bottled or canned and pasteurized in the above manner, spoils within a few days or so when opened. Experiments recently conducted have shown that tomato juice chemically preserved with 0.02 per cent Sodium benzoate and then pasteurized as usual, yielded a product which did not spoil, on occasional opening of the bottle in the laboratory, for over a period of two months in summer season.

Any other information can be had from the Fruit Specialist, Punjab.

Guava Cheese

By

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The guava is a fairly common fruit in the Punjab and can be had very cheap in the market during season. Good varieties like 'Hafsi', 'Safaida', 'Karela', etc., are also imported from U.P. in this province. The fruit is mostly consumed fresh or by making it into 'Chat' by adding a bit of juice of "Kaghzi" lime (or of any other citrus species), salt, black pepper and sugar etc., to the cut slices of the fruit.

Some products like canned guavas, guava cheese and guava jelly have been prepared in the fruit Preservation classes for several years. It is proposed in this article to deal with guava cheese which can be successfully prepared for home use from guavas as such. Even a satisfactory product results from the fruit pulp that remains after juice (pectin) has been extracted from it for making guava jelly.

Procedure:—

Step 1. Cut the fruit into small pieces by means of a slicer or an ordinary knife. Add equal amount of water. Boil to make it soft.

Step 2. Pass the pulp through a fine meshed sieve@ preferably made of a non-corrodible metal or a very fine mosquito-net cloth to remove seeds. For each pound of strained pulp weigh the following ingredients:—

1. Sugar, 1½ lbs.

2. Butter, 2 oz.

3. Citric acid*, 1 gm.

4. Salt, half a tea spoonful.

5. Colour (Red)†, sufficient.

@ Note (i) Iron sieve imparts black colour to the pulp; and in the absence of a metallic sieve of a non-corrodible metal mosquito-net cloth should invariably be used.

* Note (ii) One lime ('Kaghzi Nimboo') may be used instead of 1 gm. of citric acid.

† Note (iii) If guavas having coloured flesh (usually pink) are used, the addition of colour may not be necessary.

Step 3. Mix the above ingredients except salt and citric acid and cook on fire till sufficiently thick for spreading. Add citric acid and salt by dissolving in a small quantity of water and cook till sufficiently thick again.

Step 4. Smear an ordinary China plate with butter and spread the prepared material over it. After setting, cut into squares, triangles, or pieces of any other shape.

Step 5. Wrap individual pieces in special wrapping paper and store in card-board boxes or glass jars and use as required.

Pickling of Vegetables

By

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Vegetables used for pickling pass through three successive stages, "salting," "processing" and "finishing."

I. Salting (1) The crispness of the finished vegetable undoubtedly depends on controlling this preliminary process well, mainly by using disease-free vegetables. It is also necessary to use good containers. Chemically pure salt and water, and precise methods of ascertaining salt concentrations of the brine used are necessary.

(a) **Common Salt.**—(Sodium chloride): The following are typical analytical standards:—NaCl should not be less than 99%; iron salt should be absent; heavy metals like aluminium, copper and zinc should also be absent; lime and sulphates should not be more than 0.5%; magnesium salts should also be totally absent; pH reaction should be on the acid side.

(b) **Water.**—Analysis of water conforming to known bacterial and chemical standards for the presence of fermenting bacteria, for organic matter content, alkalinity and iron salts is indispensable.

Note:—The presence of lime in the salt or water used, has a hardening effect on the pickle. Magnesium salts impart a bitter taste. Calcium impurities, in combination with the lactic acid produced during fermentation, form insoluble calcium salts which often precipitate and

also appear as white "specks" on the pickles. In addition, calcium salts neutralize the acid formed to such an extent that spoilage due to organisms that prefer a non-acid medium starts. Calcium chloride especially retards the curing process of pickles. Iron salts, if present, produce blackening of pickles. Water high in organic matter is likely to have a putrid and decomposed odour after standing. Alkaline water will affect the skin of pickle and may cause softening of the tissue, thus enabling bacterial decomposition. It may also retard the formation of acid which would result in the introduction of non-acid organisms. Small amount of vinegar should be added to water used in pickling to prevent the growth of objectionable micro-organisms.

(c) **Vessels for salting.**—May be of pine, cypress, concrete or salt-glazed polished earthen ware vessels commonly known as 'Martabans' may be used for salting—a fairly large number of these will be required for large scale production. If of concrete, they should be coated with any good water-proof material. Concrete tanks without any protective coating should not be used, as the concrete being alkaline will tend to neutralise the acid produced in the process of pickling, thereby discolouring and softening pickles, and permitting putrifying bacteria to develop.

Note:—For wooden tanks, thorough washing with water is necessary and in some cases pre-treatment with 1% ammonia solution is preferred. In case ammonia is used, thorough washing with several changes of water is necessary. Failure to observe these precautions will result in a resinous odour being imparted to the pickle. If the tanks are of concrete, the inside should be painted with water-proof paint, if not the result will be discolouration and softening of pickles. Glazed vessels should be thoroughly washed with warm water to remove unpleasant odours.

(d) **Hydrometers.**—For purposes of determining correct concentration of brine used in the salting process, a salometer is the most convenient instrument to be used. It affords direct reading to be taken and has to be used every day to maintain the original strength of the brine, which gets diluted by water exuding from the tissues of vegetables undergoing pickling (40°, 60° and 80° salometer=10.6, 15.9 and 21.2 per cent salt respectively. 100° on salometer is equivalent to 26.5 per cent common salt which when dissolved in water gives a saturated salt solution.

SALTING OF SOME OF THE VEGETABLES COMMONLY USED FOR PICKLING.

(i) **Cucumber.**—Brine of 40° salometer (prepared by adding roughly 1 lb. of salt to 1 gallon of water) is added to the tank and when about half full unwashed and trimmed cucumbers are filled in. More brine of 40° is added till the cucumbers are completely covered by the liquid. Salometer readings are taken of brine samples every day and fresh brine at about 50° salometer added, sufficient to bring the falling concentration of the brine to 40°. Addition of salt is not recommended since it involves stirring the salt solution in the tank. This process injures the cucumbers and also introduces bacterial organisms not congenial to good fermentation. After about six weeks of standing the fermentation is almost complete. At this stage the salt concentration of the brine is gradually increased by 2° salometer every week and maintained

at about 60° salometer for another week before processing.

(ii) **Green pepper and green tomatoes.**

—(a) No variation from that of cucumber. Salting is necessary for the fermentation method as described above.

(b) An alternative method for green pepper is to fill 50 lbs. in barrels and add 6 to 7 lbs. of salt and 1 lb. of pickle—alum either direct or dissolved in vinegar. Fill the barrel with 50 to 55 grains vinegar (5 to 5.5% acetic acid). After standing for several months the peppers are repacked in kegs or glass containers and covered with a 40 grain vinegar.

(iii) **Cauliflower.**—(a) The brine concentration after the initial 40° solution should be gradually raised to 80° salometer, by 2° salometer per week, which results in a firmer and crisper product. The rest of the details as in cucumber.

(b) An alternate method for cauliflower is to add the cauliflower, after trimming the green leaves, to a brine solution of 60° salometer and removed after 6 weeks when the vegetable is fairly crisp and firm. It is then transferred to barrels when it is salted again at the rate of 5 lb. salt per 100 lbs. of cauliflower. After remaining in this brine solution for a few days it is rebrined with a higher concentration and gradually raising the brine to 60° salometer at the rate of 2° salometer per week after which it is processed the same as in cucumber. This is a slower process but produces a whiter and crisper product.

(iv) **ONIONS.**—Thorough washing is necessary by soaking in cold water or in 4% salt solution for several days to remove objectionable juices, strong odour and taste. The rest of the process is as in cucumber. It will be advantageous to sort the onions as ½", ¾", 1", 1¼" diameter and so on. This enables uniformity in the finished product.

Note:—**Raw material.**—Vegetables should be disease-free and transported from the field preferably in slatted crates, other—

wise, sweating takes place in bags or other containers and is a prelude to attack by moulds. The result will be fungal contamination of the fermenting vessels.

Salting.—Strict observance of the prescribed salt concentrations would yield a crisp, firm and transparent product. Failure of satisfying this condition would result in soft, coloured pickles by the introduction of putrifying bacteria that prefer low salt concentration. After several days in the salting tank, a thick greyish white scum appears on the surface and should be removed carefully without breaking it up and scattering it in the brine. This would result in contaminating the vegetables with some of the undesirable bacteria. On the other hand, if the scum is permitted to remain, it would reduce the acidity of the brine and settle on the pickles and decompose the vegetable matter.

Processing.—Processing is the removal of excess of salt by soaking in several changes of water after "salting". Water at 110°F is filled in tanks (the same types described for 'salting' with an outlet in the bottom), and the pickles transferred. The temperature of water can be raised by direct injection of live steam. The pickles are kept for 12 hours, the water drained off and re-filled with fresh water at the same temperature. Hardening chemicals may be used, where washed pickles show softness, at the rate of 1½ ounce (per gallon of water) of soda alum or ammonium alum or calcium chloride. But in such cases mention should be made on the label of the finished product. For cauliflower and onions alone, the temperature of water should not be more than 90°F.

Note:—In processing the prescribed temperature of water should be used to remove the excess of salt. Failure to comply will result in the breaking up of the vegetables into smaller pieces, especially in the case of cauliflower where the heads break up in small pieces which make the finished product unattractive. No iron component should be used in the tanks

or in the water inlet pipes that feed the tanks while processing. This leads to blackening of the pickles. Brass pipes also get corroded and impart a greenish tinge to the pickles. However, tinned brass pipes are useful. Wooden or rubber fittings are usually preferred. But care should be taken not to expose rubber fittings to steam.

III. Finishing:—(a) **Sour pickles.**—Processed vegetables are stored for a few days in distilled vinegar or white vinegar of 4.0 to 5.0% acidity as acetic acid, (method of preparing white vinegar: by yeast action, sugars obtained from cereals or molasses are converted into alcohol of about 8% concentration. This alcohol is distilled off and to this is added cider-vinegar or acetic acid to acidify it to 1.0% and then the alcohol solution aerated in generators of wood, packed with beach-wood shavings or corn cobs. When the acetic acid content due to the action of the acid bacteria, obtained from the air, is about 6% the vinegar is ready for use). The pickle is then transferred to fresh 5 to 6% vinegar and may be bottled after a few days' standing.

Note:—The pickles should not be left in open vessels in the priming vinegar (of 6% acetic acid) otherwise softening due to bacterial contamination takes place. The need for steeping the pickles in a closed vessel in the priming vinegar is to avoid the organic matter that causes cloudiness in the finished product, it also gives additional crispness to the product.

(b) **Sweet pickles.**—The processed stock is placed in white vinegar of 5 to 6 per cent acidity for a few days and transferred to spiced sweet vinegar prepared as follows:—8 gallons of distilled vinegar of 8% acetic acid and 20 lbs. of sugar (10 lbs. brown sugar and 10 lbs. white refined sugar) and one oz. each of cloves, coriander, mustard seed, broken ginger root and mace. The spices are heated in a bag with vinegar to 175–200°F before addition of sugar, for about an hour in a covered vessel. Any loss in

volume is replaced by addition of water. The vinegar should test 40° balling (4 lb. of cane sugar to a gallon of vinegar or directly read off from a balling hydrometer). The pickles are stored for 4 to 6 weeks in this vinegar and then transferred to fresh spiced vinegar of 55° balling (6 lbs. of cane sugar per gallon of vinegar). The pickles after a few days' standing will be ready for bottling.

(c) **Mixed Pickles.**—Can be prepared by

mixing any of these individually prepared vegetables in any proportion desired by the manufacturers.

Note:—The above is a very brief note prepared from the literature on the subject of pickling. Experiments on the preparation of different kinds of pickles are in hand, the results of which will be communicated in due course.



Drying of Vegetables

By

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Due to the possible use of dried vegetables as army rations, a large number of enquiries as to the method of drying vegetables, particularly potatoes, have been received at the Punjab Agricultural College from all over India. It is extremely difficult to reply individually to such enquiries in detail. An effort has, therefore, been made to give in this article (1) the general principles involved in the drying of vegetables, (2) a detailed method of drying potatoes and also brief outlines of the methods of drying some of the important vegetables like onions, cauli-flower, carrots and peas with some experimental results obtained in this connection under the Fruit and Vegetable Preservation scheme, Lyallpur, financed jointly by the Punjab Government and the Imperial Council of Agricultural Research.

Sun-drying v. dehydration:

There are two methods used for drying fruits and vegetables viz. (a) drying in the sun and (b) dehydration, i.e. the removal of moisture by artificial heat in specially constructed chambers, called dehydrators, where temperature, humidity, and rate of flow of the air in the drying chamber can be regulated. While sun-drying is largely practised for drying fruits and the product also is of satisfactory quality, though not coming to the standard of the dehydrated product, vegetables are seldom dried in the sun as they generally acquire unattractive colour and are poor in taste and cooking quality. Dehydration has also other advantages over sun-drying inasmuch as (a) the product is kept free from dust, (b) flies get no chance of depositing eggs on the product, (c) drying time is greatly

reduced, (d) danger of damage by rain, storm or humid atmosphere is eliminated, and (e) a product of more uniform quality can be got. A dehydrated product is generally of better quality although the cost of dehydration must necessarily be more than that of sun-drying. Hence dehydration is generally employed for drying vegetables and the product thus obtained, in most cases, is a very satisfactory substitute for fresh vegetables after the dehydrated vegetables have been soaked for several hours before use.

Sun-drying :

Sun-drying, mostly used for drying fruits, does not require any complicated equipment. The prepared fruit is spread on specially constructed wooden trays, the size depending on the type of fruit used, and the trays are placed singly in long rows on wooden frame-work (about 1 ft. above ground-level) directly in the sun in an open yard called the drying yard. The size of the trays may be 3 ft. x 8 ft. or 2 ft. x 3 ft. or 3 ft. x 6 ft., and they are generally made of wooden slats or strips if used for drying fruits, and of screen mesh ($\frac{1}{8}$ inch) for vegetables. Flies, bees and wasps become a serious nuisance in sun-drying and are extremely difficult to control. Fine mosquito netting or fine metallic screens may be used with advantage for covering the exposed trays.

Dehydration on home scale:

Vegetables in the home are dehydrated in a 'home-drier'. This is a strong galvanized iron sheet box 3 ft. x 2 ft. x 3 ft.; with a strong perforated iron sheet bottom. The sides and top of this box are enclosed in wooden frame-work and the box is supported on an iron stand $1\frac{1}{4}$ ft. high. The source of heat can be an ordinary petroleum oil-stove, or a small charcoal furnace (angithi) placed below the perforated bottom (in the experiments reported later, due to the availability of gas, large gas burners were used for heating). In order to let off the moisture the drier has slits 2 ft. x 1.5 in. along the length on both sides about 4 in. below the top. These

slits have collapsible metallic flaps which can be opened or closed to regulate the flow of evaporating moist air. The drier can accommodate 7 trays $2\frac{3}{4}$ ft. x 2 ft.

Dehydration on commercial scale:

For commercial dehydration several types of dehydrators like the kiln type, stack driers, recirculating air blast type drier, Oregon tunnel driers, etc. are used in foreign countries.

Unfortunately, there are no firms in India which can supply commercially built dehydrators or furnish a working plan. Due to the present unsettled conditions, the difficulties of importing them are indeed great. An attempt has, therefore, been made to reproduce an original design of a tunnel dehydrator (recirculating air blast type after Christie and Ridley 1929) in Fig. 2.

Experiments on Commercial dehydration of potatoes at Lyallpur:

The method of dehydrating potatoes as practised in our experimental tunnel dehydrator is briefly described below:—

1. **Raw material:**—Potatoes of large size free from disease and fully ripe with as few eyes as possible were selected.
2. **Washing:**—Potatoes as received from the market were thoroughly washed in running water in a cement tank to remove dirt and other extraneous matter.

3. **Peeling and trimming:**—Peeling and trimming operations were done by hand. Washed tubers were peeled either by means of a sharp stainless steel knife or by means of oyster shells ("Sippis") with the centre of the convex side ground to sharp chisel-like edge. Both the peeling devices gave satisfactory results, but peeling with 'Sippi' was quicker than peeling with knife but entailed slightly higher losses. 'Eyes' and undesirable portions of the peeled potatoes were then removed by means of stainless steel, sharp, spoon-shaped knives.

Note:—Peeled and trimmed potatoes were then immersed in water.

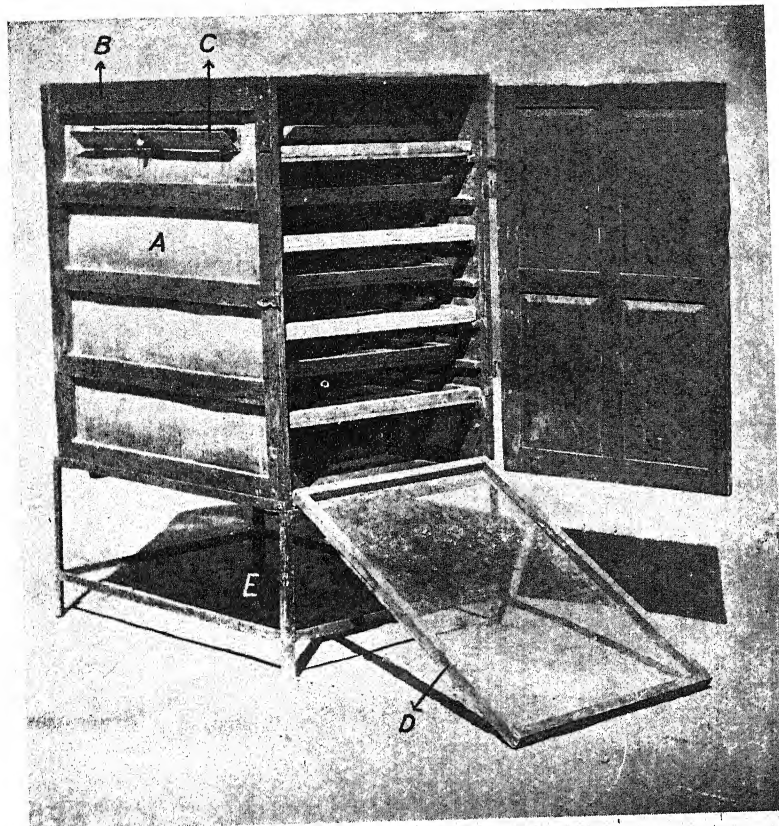


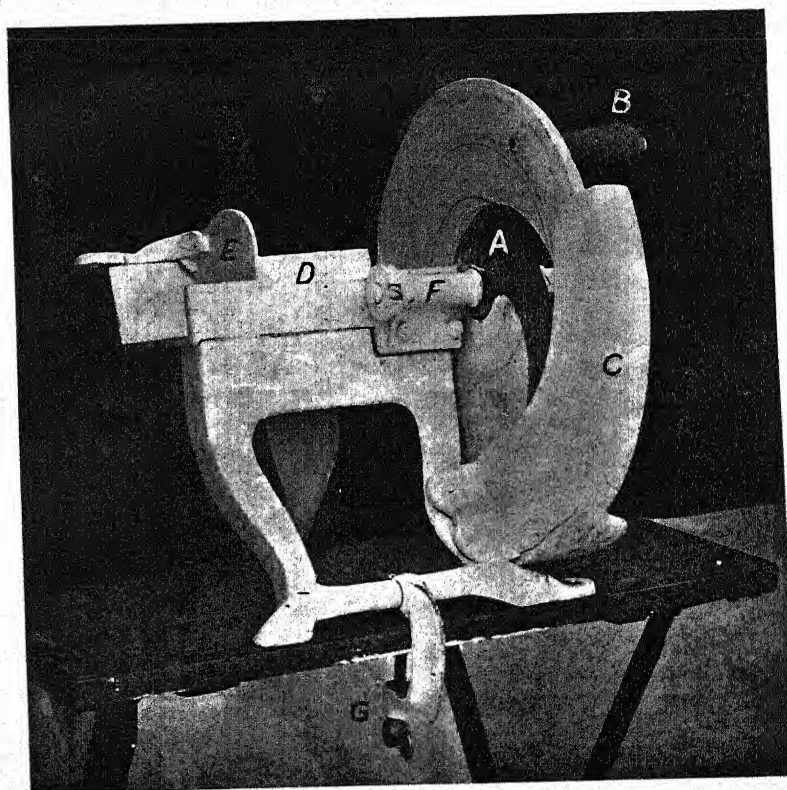
FIG. 1. Home-drier for dehydrating fruits and vegetables.

- A. Galvanized iron chamber 3 ft. \times 2 ft. \times 3 ft.
- B. Wooden frame enclosing chamber A.
- C. Collapsible metallic flap to regulate the flow of evaporating moist air.
- D. $\frac{1}{8}$ in. mesh galvanized iron screen tray (32 in. \times 24 in.).
- E. Space for placing the source of heat.



FIG. 3. Sterling Slicer No. 20 (U.S.A. make).

- A. Sharp, curved steel knife.
- B. Handle to revolve knife.
- C. Guard against the revolving knife.
- D. Space for putting potatoes.
- E. A movable device to push the potatoes for slicing.
- F. Screws to adjust the position of steel blade to cut slices of a desired thickness.
- G. Screws to fix the slicer on the working table.



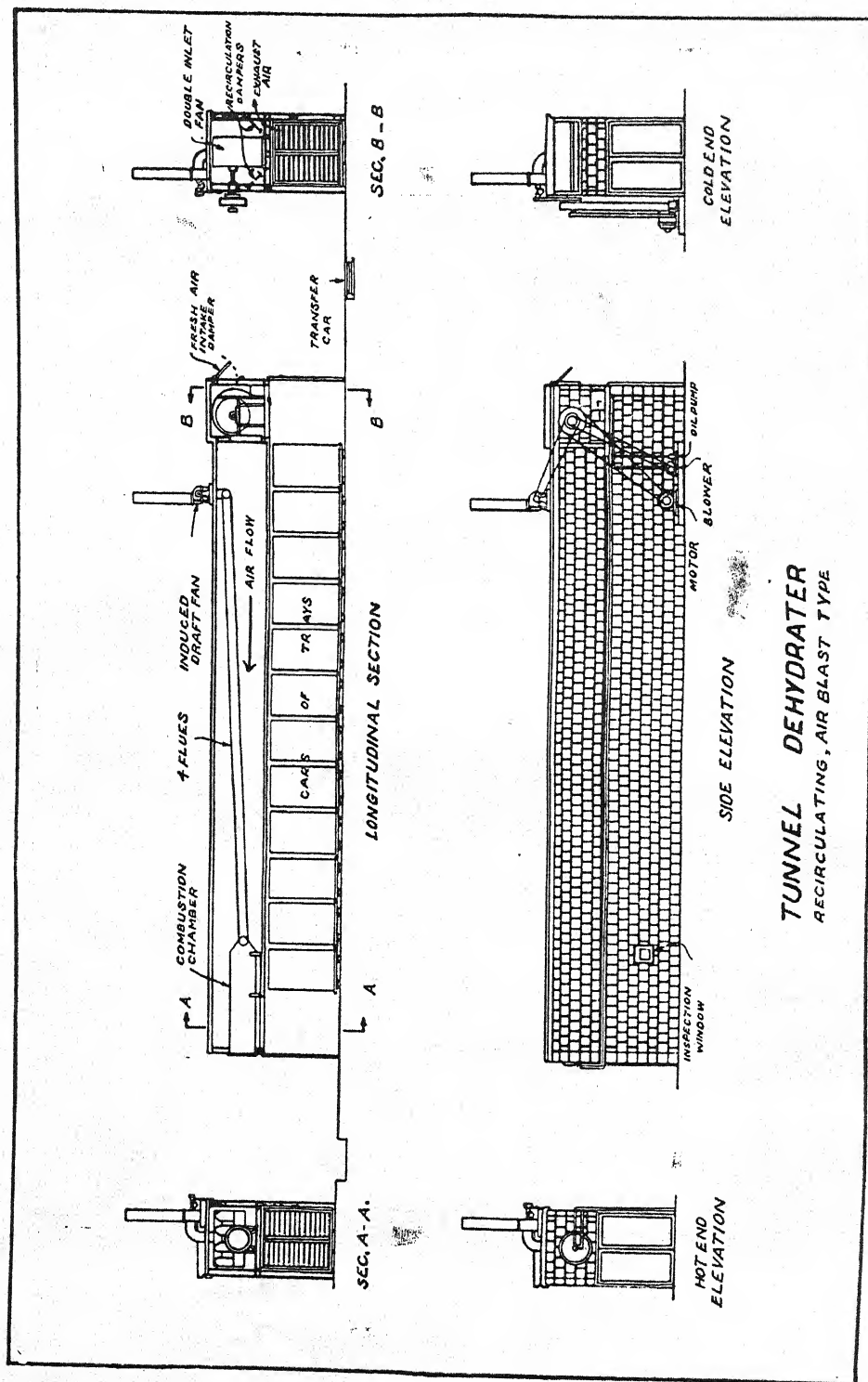


FIG. 2. Recirculation air-blast tunnel dehydrator (after Christie and Ridley).

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4. **Slicing:**—Peeled potatoes were sliced about 3/16th" thick in an ordinary 'fodder cutter' type slicer which could be adjusted to cut slices of desired thickness.

Cut slices of potatoes were immediately put in stainless steel tanks containing cold water. In some cases when the slices had to wait considerably, say 5 to 6 hours before they could be put into the dehydrater, they were placed in 0.05% potassium meta-bisulphite solution. This prevented spoilage which is liable to occur in slices stored in brine or water during hot summer months.

5. **Blanching and chilling:**—The prepared slices were then put in small lots of about 15 lbs. in a perforated galvanized iron bucket which was placed in boiling water in an open galvanized iron tank heated on direct fire (a coal furnace). The bucket was constantly stirred with a lever arrangement and the temperature of water was not allowed to go below 190°F. Potatoes of different lots took about 4 to 6 minutes for proper blanching.

Properly blanched slices along with the bucket were then dipped in a tank containing running cold water.

Note 1:—Blanching should be carried to a stage when the starch in the blanched slices is neither raw nor overcooked. This is easily ascertained by tasting the blanched slices. If the slices are under-blanched then the under-cooked starch can be felt under the teeth giving a hard and gritty sensation. Over-cooked slices are too soft and break even with a slight touch. Properly blanched slices for drying purposes should be just midway between the above two stages. With experience one can judge this stage by simply pressing the slices between two fingers.

Note 2:—Where steam is available, blanching can also be done in steam-jacketed kettles.

6. **Dehydration:**—Before giving the actual process of dehydrating the potato

slices as prepared above, it is necessary to give the details of the dehydrating plant used for this purpose. This is given as under:—

A. Tunnel dehydrater (recirculating air blast type):

General principles involved in the working of this type of dehydrater along with its diagrammatic sketch have been given in the article entitled "Drying of Vegetables", (Lal Singh and Girdhari Lal, Indian Farming, June, 1941). A small experimental tunnel dehydrater (three trolley unit) has been constructed at Lyallpur. The description of the dehydrater is briefly given below:—

I. Dimensions:—

Drying chamber:—Length* of the tunnel, 13 ft.; Width, 5 ft.; Height, 6¼ ft.

Heating chamber:—Length, 10¼ ft.; Width, 5 ft.; Height, 3 ft.

Fan chamber:—Length, 2½ ft.; Width 5 ft., Height, 3 ft.

Hot air draft inlet slit in the drying chamber at hot end:—Dimensions, 5'x1'.

Hot air from the heating chamber passes through this opening into the drying chamber.

II. Fresh air arrangement:—

Fresh air damper at the cold end—3¼' x 1½'.

The above has an adjustable lid which can be opened or closed as desired for the working of the dehydrater.

III. Side dampers for controlling the humidity:—

There are two dampers on both sides of the tunnel near the cold end which are fitted with adjustable metallic flaps to regulate the flow of outgoing moist air in

*This is not a suitable size for commercial production. For this purpose tunnel length should at least be 26 ft.

accordance with the humidity in the drying chamber. Some of the moist air is thus thrown out and the rest is allowed to go into the fan chamber to be recirculated in the drying chamber.

The dimension of these two dampers—18" x 9".

IV. Heating system:—

Because we had a steam boiler available here in our laboratories, we have utilized that for heating purposes. There are two sets of coils heated by steam. In making these coils 160 ft. one inch tubing and 110 ft. of $\frac{1}{2}$ " tubing have been used. These are placed in the heating chamber just in front of the blower fan (see below).

The above system of heating the coils is no doubt clean and permits of better regulation in temperature, but its thermal efficiency is fairly low, which makes this system rather expensive as it involves high fuel consumption.

It may be mentioned here that Messrs. The Northern India Fruit Products Co., Lyallpur have installed coal furnaces on top of the drying chamber from which flues have been taken through the heating chamber on top of the drying chamber. These flues which are connected to chimneys are heated by the products of combustion of coal which pass out through the chimney. This system has also been found to be very efficient and is much less expensive than the steam heating. For commercial manufacturers coal furnace system will be more suitable as it dispenses with the installation of a boiler.

V. Air-flow system:—

One multivein type fan 20" in diameter with 12 blades or veins is placed in the fan chamber (see item I) which blows air directly on to the coils placed in the heating chamber on top of the drying chamber.

For 13 ft. tunnel, the speed of air flow in the chamber works out to be about 200

linear ft. per minute as against 500—600 ft. in normal commercial tunnels of larger size, say 25 to 30 ft.

Note:—While running the dehydrater continuously, the space around the first trolley near the hot end where the heated air is entering the drying chamber should be totally closed to stop the passage of air through the empty spaces. This has been done in the present case by means of thick canvas flaps.

VI. Trays and Trolleys:—

Dimensions of trays:—Area of $\frac{1}{8}$ " mesh galvanised iron sieve fixed in deodar wooden frame—2 $\frac{1}{4}$ ' x 2'.

Dimensions of trolleys:—Length, 2 $\frac{1}{2}$ ft.; Width, 4'-8"; Height, 5'-8".

There are four trolleys of the above dimensions. Each trolley accommodates 40 trays in two rows. Space between each tray is 2". The tunnel is worked as a three trolley unit.

VII. Trolley track and turn tables:—

The triangular track (about 100 ft. long, 2 ft. 4" wide) has been built with three turn tables at three corners of the track which enable the transferring of loaded trolleys into the drying tunnel.

B. Running of the dehydrater:—The prepared slices under item (5) above were put in single layers on wire gauze ($\frac{1}{8}$ " mesh) trays. One square foot of tray surface contained about 1 to 1 $\frac{1}{4}$ lb. of slices. The trays were then loaded in a trolley which was rolled into the drying tunnel at its 'cold' or 'entrance' end. The dehydrater, the temperature of which was 140—145°F. at the cold end and about 170—180°F. at the hot end, was then closed air-tight. After about two and half hours, second loaded trolley was rolled in and the tunnel closed air-tight. This process was repeated for the third trolley. After a lapse of about 2 $\frac{1}{2}$ hours after the third trolley had gone in, the first trolley (i.e., which was put in the dehydrater in the beginning) was taken out at the 'hot' end

with dried potato slices and another trolley freshly loaded was pushed in through the 'cold' end. In this way the process became a continuous one. Thus after every two and half hours, one trolley with dried potatoes was taken out at the hot end and a freshly loaded trolley was rolled in at the cold end.

During the process of drying, the temperature and humidity were controlled by the aid of side-dampers and the fresh air damper as follows:—

Temperature:—

Cold end (damper end): 140—145°F.

Hot end (draft end): 160—165°F.

Relative Humidity:—

Cold end: 40—45%

Hot end: 20—25%

Note 2:—The temperature and humidity regulations:—

The temperature of wet bulb and dry bulb thermometers on both ends should be read at intervals of 30 minutes and the humidity per cent calculated at once to enable the observer to know the actual condition inside.

Thus in 24 hours, after the 1st trolley with dried potatoes was taken out, 9 to 10 trolley loads of fresh potatoes could be dried.

Note:—(1) Drying time for each trolley varied from 7 to 8 hours.

(2) Capacity of this dehydrator—about 4 mds. of dried potatoes per 24 working hours, after the process has become continuous.

Drying of Cauliflowers:—Cauliflower heads are separated, washed and the 'flowers' are broken apart and cut into halves or smaller pieces as desired. They are blanched for 2 to 4 minutes in boiling water (tender 'flowers' will require comparatively less time than tough 'flowers'), rinsed in cold water and dehydrated at a temperature of 135°F. to 140°F.

Drying of carrots:—Carrots are thoroughly washed in running water, the peel and small rootlets (if any) are removed by lightly scraping the carrots with a

stainless steel knife held perpendicularly in one hand. Carrots are then sliced to 1½" to ¼" thick slices in a slicer and blanched in a boiling 2 per cent common salt solution for 2 to 4 minutes. The blanched carrots are then rinsed in cold water and dehydrated at a temperature of 165°F. to 175°F. Carrots can stand higher drying temperature than other vegetables.

Drying of Peas:—Tender peas give a much better dried product than fully mature peas which are usually starchy and have a tendency to become tough and mealy during drying. Peas are separated from the pods either by hand or in pea-shelling machines. They are blanched in boiling water for two to five minutes according to the tenderness or otherwise of the peas. The blanched peas (not rinsed in cold water) are spread directly on drying trays and dehydrated at 140 to 145°F. and dried till entirely crisp.

Drying of onions:—Onions are trimmed and peeled by hand (thin outer peel is removed) and then cut into very thin slices. Slices thicker than ⅛th of an inch are liable to case-harden during drying. Sliced onions are then dipped in cold 5 per cent brine (common salt solution) for about five minutes and then dehydrated as usual) preferably at a temperature of 135°F. but the temperature should in no case exceed 140°F. Onions are not blanched like other vegetables as they stick to the drying trays and are unattractive in appearance. A dip in cold brine reduces their tendency to darken during drying and subsequent storage.

All the samples of dried vegetables obtained by the above methods on re-soaking assumed their normal appearance which almost resembled fresh vegetables. These vegetables are packed and stored just like dried potatoes.

Sun-drying of all the above vegetables was also given a trial last year, but the products were found to be rather dark in colour, unattractive and had a poor cooking quality, and they were found to be far inferior to the dehydrated products in every respect.

Canning of Pears

By
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and
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Biochemist,
Fruit Products Laboratories,
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Pears are extensively grown in the Kulu Valley (Punjab). In some years it does not pay the growers even to pick and market the fruit, and thus much of the crop is wasted. Experiments on canning of five important varieties of pears, grown in this tract, have indicated that William's pear (also known as Bartlett) gives an excellent canned product. This variety is commonly grown in that valley. A satisfactory method of canning these pears has been developed at the Fruit Products Laboratories, Punjab Agricultural College, Lyallpur under the Fruit and Vegetable Preservation Scheme (Punjab) of the I.C.A.R. and the product prepared has been found to compare very favourably with the imported canned pears.

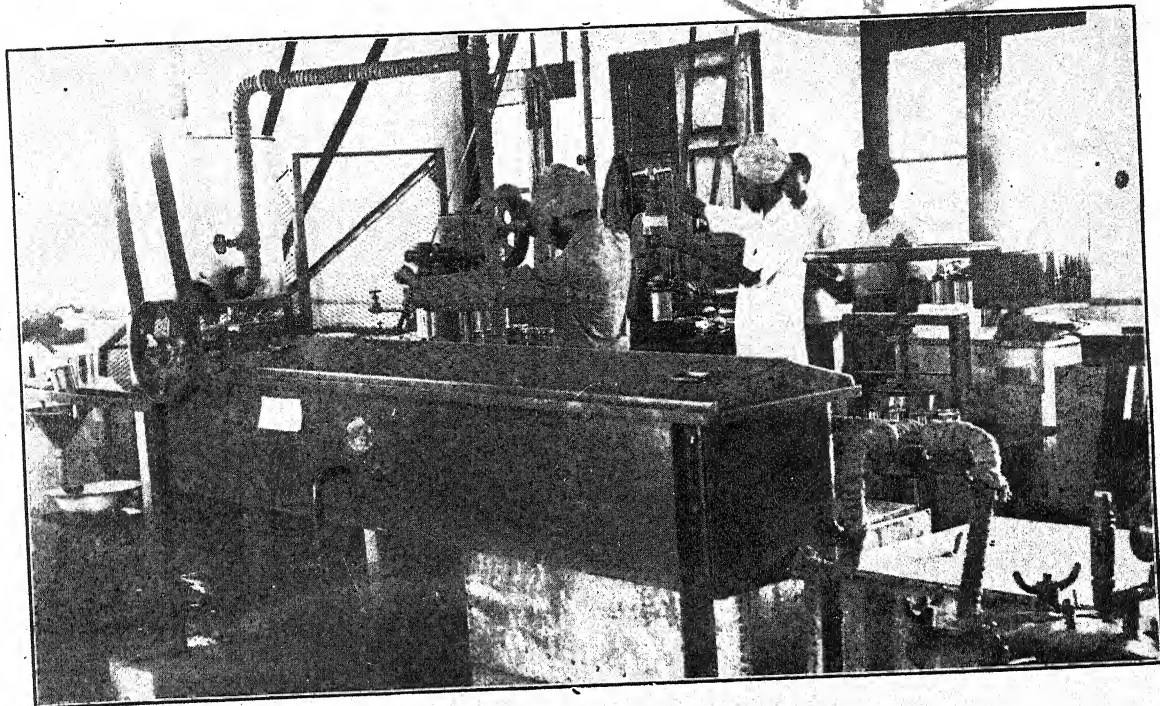
It may, however, be mentioned that the kinds of pears grown in the Punjab plains are not suitable for canning purpose.

STEP I.—Selection of Fruit.—At the time of picking, the fruit should be fully developed in size, firm and green in appearance. A few days' storage after picking develops necessary qualities desirable for successful canning, viz., the fruit becomes light yellow in colour, soft in texture and develops full pear aroma and sweetness.

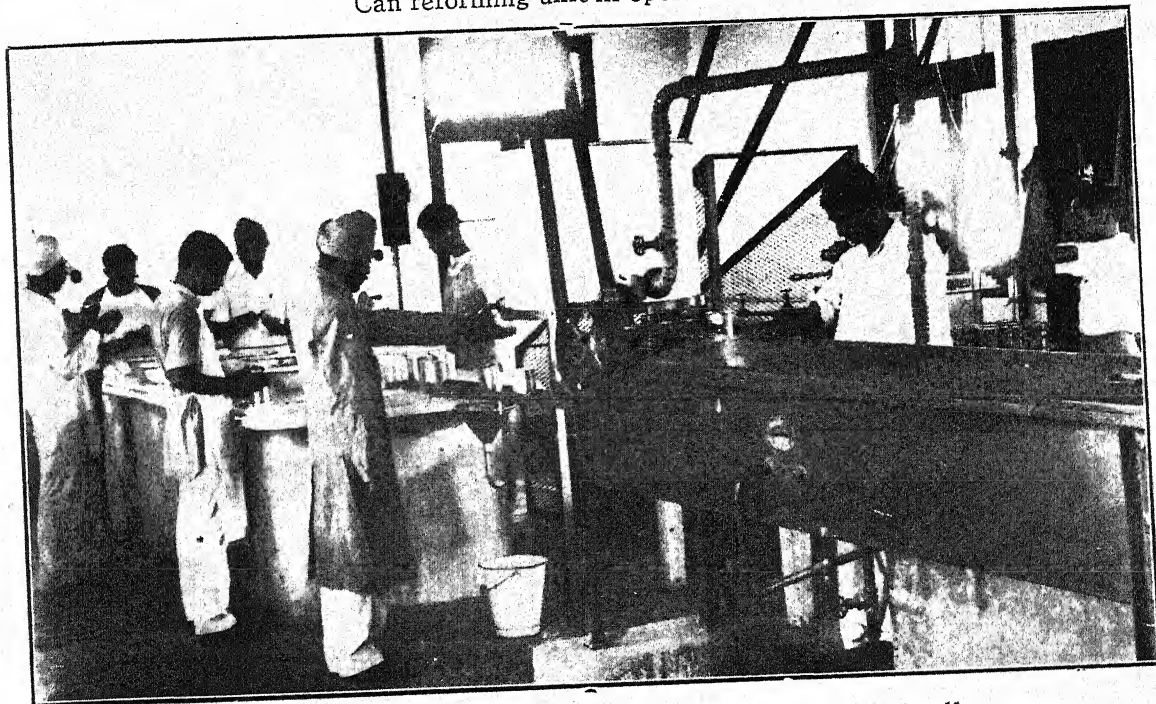
Note:—To determine the right stage of maturity of picking, a "pressure tester" is usually employed. Determination of the hardness of fruit of William's pears at Kulu by means of a pressure tester, has been carried out and the right stage of maturity for picking the fruit for canning purpose has been determined. Further information on this point can be supplied on request.

STEP II.—Peeling.—Select from store (Step I) sound fruit of uniform size and ripeness, carefully peel by hand with a special curved knife having a guard which controls the thickness of peel; smooth evenly the entire surface of the peeled fruit. Immediately after peeling, submerge the peeled fruit in 1-2 per cent common salt solution as otherwise rapid discolouration (browning) of the exposed peeled surface takes place.

STEP III.—Paring and Coring.—Cut the peeled fruit longitudinally through its stalk end by means of a very sharp knife (special knives known as paring knives are usually employed for this purpose). The two pieces thus obtained are cored, trimmed and stemmed by means of special coring knives. (The process of coring, trimming and stemming involves a special technique which can be easily acquired by practice).



Can reforming unit in operation.



Canning of Pears at the Fruit Preservation Laboratories, Lyallpur.

Note:—For commercial-scale production, factories in foreign countries usually employ hand labour in Steps II and III but recently several types of peeling, paring and coring machines which are worked mechanically, have been introduced in the market. A very effective and compact unit of machinery which will peel, cut, stem and core the pear, has quite recently been brought in the market by Messrs. Anderson-Barngrover (Food Machinery Corporation, U. S. A.) and is reported to be quite efficient.

STEP IV.—Filling and Syruping.—Grade the prepared fruit (Step III) and carefully pack halves of the fruit in unlacquered cans of the desired size (A2 and A2½ size cans are used for ordinary commercial packing. For 'fancy grade' fruit, A2 size cans usually contain 4 to 6 pieces and A2½ size cans 6 to 10 pieces.) Fill the can with hot syrup 40.0 per cent syrup—6 lbs. 11 oz. sugar dissolved in one gallon (10 lbs.) of water at 20°. The syrup thus obtained will give a reading of 40° on Brix or Balling hydrometer which is an inexpensive instrument, obtainable from any firm stocking scientific instruments and chemicals.

STEP V.—Exhausting and Sealing.—Put the filled cans with the top-lid placed loosely on top, in hot water at 180° to 190°F (the top of the can should remain about an inch or so above the level of water) for 6 to 8 minutes. This process is called 'exhausting'. Seal the can with a can sealer immediately after exhausting.

STEP VI.—Sterilizing and Cooling.—Put the sealed cans in boiling water (at 212°F) and sterilize them (A2 and A2½ size) for 25–30 minutes. Remove the cans from the sterilizing vessel immediately after sterilization and put them in cold, preferably running water. After thorough cooling, remove the cans, wipe the moisture carefully with a dry piece of cloth (this is done to avoid rusting of the outer surface of cans in storage) and store in a cool dry place.

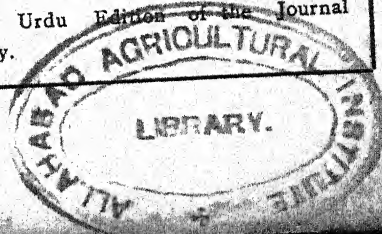
Note:—For large scale production various units of machinery, covering the processes outlined in Steps IV to VI, are available in the market. We have in our Canning Hall, (equipped out of Government of India Rural Development grant) a complete canning unit consisting of (1) a syruper or brine tank, (2) an exhaust box (worked with steam), a sterilizing tank (worked with steam) and a cooling tank. This unit can be used for canning all types of fruits and vegetables (for sterilizing vegetables, there is provided a special pressure retort). This unit is capable of producing 2880 cans per 8 hours working day, provided the supply of the prepared fruit is certain throughout the working hours. In addition to the Canning unit we have a set of machinery consisting of (1) a body reformer, (2) a flanging press, and (3) a can sealer, for reforming flattened cans. All these can be seen by visitors interested in the subject.

TO SUBSCRIBERS OF THE PUNJAB FRUIT JOURNAL.

Most of the subscribers of the Punjab Fruit Journal started subscribing to the Journal from January 1941. With the supply of this issue, their annual subscription expires. They are requested to renew their subscriptions during this quarter. The revised rates of subscriptions are as below :—

Editions.	M.O. basis.	V.P.P. or for Govt. Departments on bill basis.
English Edition	Rs. 3/- annually	Rs. 3/8/- annually.
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In case no subscription or any other intimation is received by the end of this quarter, the next issue of the Journal will be sent per V.P.P. of Rs. 3/8/- and Rs. 1/12/- to the defaulting subscribers of the English Edition and the Urdu Edition of the Journal respectively.



Vinegar Manufacture for Home Use

By

Lal Singh, Fruit Specialist,

Punjab, Lyallpur.

(The following is a copy of the Radio talk broadcast by S. S. S. Lal Singh, from All-India Radio Station, Lahore, some time ago). Editor.

Food Laws in many countries provide that vinegar, in order to be saleable in the market, must contain at least 4% acetic acid. Leaving aside some cheap brands or those which are synthetically prepared just by adding acetic acid to water, most vinegars found in the market, do contain 5 to 6% and a few even upto 10% acetic acid besides varying amount of organic acids, colouring matter, salts, etc., which impart the necessary flavour and aroma. The vinegar is ordinarily labelled according to the fruit from which it is prepared, i.e., apple vinegar, grape vinegar, etc., etc.

Good vinegar for home use can be prepared from grapes, phalsa, apples, oranges, mangoes, dates and in fact from any sweet fruit, the juice of which contains 10 to 20 per cent. sugar and also from sugar cane juice. Third grade fruit, i.e., windfalls, blemished etc., or even cores or peels of fruit which are normally discarded during the process of canning or jam making, can also be utilised for this purpose. The juice is extracted by washing the fruit, crushing, heating and then pressing the same. In the case of some fruits, small amount of water has to be added before heating the fruit.

If vinegar is prepared under efficient supervision, then the amount of acetic acid in the vinegar, is about one half of the amount of sugar. In other words, a juice containing 10% sugar should yield vinegar

containing about 5% acetic acid. Since in actual practice some wastage does take place in the process, it is advisable to prepare vinegar from a juice containing at least 12 or preferably 15% sugar. Consequently if the juice contains excessive amount of sugar, it is diluted with water and if it is deficient in sugar, it is either concentrated or some sugar is added to it. Sugar cane juice can be used as such. Dried fruit should be soaked in water for 24 hours, then heated and pressed.

The amount of sugar present in the juice can be determined by a brix hydrometer which can be purchased for a couple of rupees from any chemist's stores, in case vinegar is to be prepared on a considerable scale.

Alcoholic fermentation:—Vinegar manufacture involves two fermentation processes. Firstly the sugar present in the juice is fermented into alcohol which is subsequently converted into acetic acid, i.e., vinegar. In order to get best results, it is extremely necessary that first fermentation (i.e., converting of sugar to alcohol) should be complete before 2nd fermentation (i.e., conversion of alcohol to acetic acid) is started. Both kinds of fermentations should not go simultaneously in the juice which is likely to be the case if the juice is not pasteurized. This is accomplished by heating the juice to almost boiling point in order to kill all the germs and then pouring the pasteurized juice in a clean barrel or glass carboy which should be previously sterilised by steam or boiling hot water and soda ash. A small cake of pure wine yeast (obtain-

able from druggists or wineries in compressed form) is added to ferment the juice. It is desirable to fill the barrel or carboy completely to exclude air from the container. The hole of the barrel or the mouth of the carboy is plugged with cotton wool which allows carbon dioxide to escape from the juice during fermentation and also prevents contamination of juice by the air organisms as they cannot easily pass through cotton wool. To obtain the best results, the temperature of the juice should neither fall below 65°F. and nor rise above 90°F. The juice should be stirred frequently during the first week. Within 2-3 weeks all sugar of the juice should disappear i.e. be converted into alcohol. The amount of sugar present in the juice from time to time may be ascertained either by brix hydrometer or merely by tasting. When all sugar disappears, then the fermented juice is stored for a week or two to allow sediment to settle down after which the clear liquid is

syphoned or poured off into another clean barrel.

Vinegar fermentation:—After the fermented juice is poured into clean barrels, it is then inoculated with vinegar bacteria and acidified to prevent injurious bacteria from growing. Both these objects are achieved by adding a pound of home made or barrel vinegar (unpasteurized) to each gallon of fermented liquid. In the vinegar fermentation (unlike the first alcoholic fermentation) exposure of liquid to air is necessary and consequently the barrel or carboy should not be filled more than three quarters. The shallower the depth of the vessel and the greater the surface of the liquid coming in contact with air, the more rapidly the vinegar formation takes place. For this purpose, air holes are provided on the top and sides of the barrel above the surface of the liquid and these are screened with fine nettings or cheese cloth to exclude flies. A film of

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vinegar bacteria is formed on the surface of the liquid which should not be disturbed by stirring or by moving the vessel. Temperature should be from 60° F. to 80° F.—the higher temperature being better and vinegar formation should be complete in about 2-3 months' time. The vinegar is then drawn off the sediment and filtered through several thicknesses of cloth. It is then bottled and well corked and heated in hot water to 150° F. for a few minutes. In this condition it should keep perfectly for years and improve with age.

It may also be mentioned that the sediment left at the bottom in first fermentation (i.e. alcoholic fermentation) can be used to inoculate the second lot of fresh juice. Similarly the sediment left at the bottom in vinegar fermentation can be used to inoculate second lot of

fermented juice. Under no circumstances, however, the barrel used for vinegar fermentation should be used for alcoholic fermentation.

Rapid process:—Since rate of vinegar formation depends upon the amount of air supplied (i.e. exposure of juice to air), several devices like vinegar generator, have been worked out to expedite the process for commercial production in which vinegar formation can be completed within the course of a few days. Detailed information about this process as well as several diseases which have to be guarded against in commercial manufacture of vinegar and also several methods of clarifying and filtering finished product cannot be given in this short article. Those interested in the subject can correspond with the Fruit Specialist, Punjab, Lyallpur.



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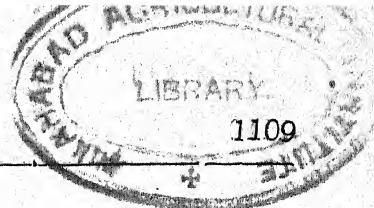
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The Control of 'Spoilage' in Canned Foods

By

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Fruit Products Laboratories,

Lyallpur.

It is common knowledge that most fresh fruits and vegetables have on their surfaces an adhering layer of micro-organisms, which occur as different types and vary in their numbers and sizes. Invariably both fruits and vegetables from different growing localities have a mixed contamination on their surfaces and it is easy to understand when one is informed that sometimes the air we breathe is charged with almost innumerable micro-organisms belonging to more diverse groups than are present on fruits and vegetables. It does not necessarily follow that all of the organisms are in some way concerned with the decomposition of the vegetables or fruits, for, the natural resistance to disease of the growing fruits or vegetables is sufficient to prevent them from attack. Nevertheless, the fundamental requirements of the canner is to avoid obviously diseased fruits, firstly, by a process of selection and, secondly, by known methods of chemical sterilization to eliminate surface infection. The first process involves a number of trained hands to spot out quickly diseased specimen, while the latter process involves great care in handling and, indeed, in commercial factories the advantage gained may not be commensurate with the cost of chemicals involved.

The selection of disease-free raw

material, however, has two obvious advantages in view, primarily to eliminate any of the undesirable products of decomposition formed by the organisms in the raw material and, secondarily, to lessen the 'micro-organismal load'. It is a simple law of 'Pasteurization' that more the organismal load or numbers, the longer the time taken to kill them and 'vice versa'. At the same time the canner must remember that longer the period of cooking or sterilization, necessitated by the heavier load of organism, the greater will be the loss in flavour and taste resulting in inferior quality products, so that it is highly desirable that the raw material to start with must be as disease-free as possible.

It should be realised that along with this selection of raw material it is very necessary to rigorously enforce sanitation, clean apparatus and hermetically sealed containers. It is equally important to impress on the workers in the Canning industry the necessity for practising the essentials of personal hygiene. These fundamental working details if strictly followed not only eliminate losses by spoilage, loss of colour or flavour so commonly caused by organisms, but would add a degree of safety to the industry that is rightly demanded by the consumer.

Summary of the Work Done in Fruit and Vegetable Preservation at the Fruit Products Laboratories, Lyallpur

By

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Lyallpur.

Enquiries are frequently received from the public as to the nature of experimental work being conducted in these Laboratories. It is not possible to give detailed information in this small publication about all the work which has so far been done; but for the benefit of readers it seems desirable to give a very brief summary of the work so far done. In the case of important products, fairly detailed information is given and in case of others only a passing reference is made. For any detailed information reference can, however, be made to the Fruit Specialist, Punjab, Lyallpur.

I. Citrus Fruit Squashes and Cordials:—

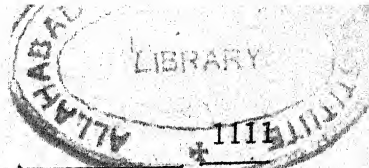
(i) **Squash from Sangtra Maltas, Sangtras (Loose oranges) and Nagpuri Sangtras:**—During storage, colour, flavour and taste of squashes obtained from the above fruits are very unstable. After a great deal of experimentation lasting over several seasons these have been successfully stabilized. The flavour has been fortified satisfactorily by adding appropriate doses of different combinations of some fruit

essences. Colour of these squashes has also been improved by adding certain brand of permitted food colours.

(ii) **Lemon and lime squash:**—Lime squash can be prepared from limes ('Kaghzi Nimboo') and also by blending lime juice with 'galgal' juice (1:1). Lemon squash can be prepared from 'galgals' (flavour is fortified by adding lemon essences) and European and Eureka varieties.

(iii) **Lime Juice Cordial:**—Different methods of clarifying lime juice for preparing the cordial have been studied and a satisfactory product has been made.

(iv) **Lemon Barley Water:**—Use of flour of local barley has been found to give an equally good product as obtained from foreign barleys like Pearl Barley and Robinsons Patent Barley. Lemon Barley water can be prepared from lemon juice (foreign varieties) and 'galgal' juice—in the latter case the flavour has been successfully fortified by the addition of a combination of lemon fruit essences.



All the above products could be best preserved by appropriate doses of Potassium meta-bisulphite (not exceeding 350 p.p.m.).

Articles on the preparation of some of the above beverages are given elsewhere in this issue.

In connection with the work on squashes, the following problems were also investigated:—

(a) **Determination of real fruit juice content in squashes:**—This is an investigation of a very intricate nature and has been carried out over a number of seasons. Finally a method for determination of juice content (based on its protein content) has been standardized.

(b) **Changes in the Vitamin C content of squashes preserved by different methods:** Squash preserved chemically by Pot. meta-bisulphite showed the least deterioration in vitamin C content as compared to that preserved either by sodium-benzoate or pasteurization.

II. Tomato Products :—

(i) **Tomato Ketchup:**—A method of preparing this product has been standardized which is described in detail elsewhere in this issue.

(ii) **Tomato Juice:**—(a) Method of preparing tomato juice as evolved in these laboratories and published in the Punjab Fruit Journal Vol. 1, No. 3 September, 1937, has been reproduced.

(b) An interesting data have been collected on the loss of vitamins A and C during the various stages of its manufacture.

III. Mango Products:—

(i) **Mango Squash:**—Juicy type mangoes which are abundantly grown in the Punjab, yield a very refreshing and tasteful beverage having a very marked characteristic mango flavour even after 1½ years' storage.

(ii) **Canned Mangoes:**—'Saroli,' 'Dussehri' and 'Safaida' varieties commonly grown in U.P. have been found to be the best can-

ners. A method of canning these varieties has been developed.

(iii) **Dried mango juice or leather (Am-Paper):** A satisfactory product has been prepared by drying the juice of mango under hygienic and controlled scientific conditions.

(iv) **Mango Chutney:**—A satisfactory recipe has been evolved for preparing mango chutney from cheap type mangoes.

IV. Canned Fruits:—

(i) **Pears.**—About half a dozen varieties of Kulu pears were tried to find out the most suitable variety for canning. Williams' or Bartlett pear was found to be the best canner. Maturity trials to find out the best time of picking for canning were carried over two seasons at Kulu and it was found that fruit picked at 13-14 lb. pressure test and stored at 60—70°F for about a week yielded the best canned product.

(ii) **Grape-fruit.**—Grape-fruit can be successfully canned in the lacquered cans.

V. Canned Vegetables:—

(i) **Canned Peas.**—About half a dozen varieties of peas were tried for canning. Out of these, Suttons Abundance and 'Suttons Main crop' were found to be satisfactory canners.

VI. Jams, Jellies and Marmalade:—

The following products of this category have been standardized after an experimentation over a number of seasons.

1. Orange Marmalade.
2. Plum Jam.
3. Pears Jam.
4. Apricot Jam.
5. Peach Jam.
6. Guava Jelly.
7. Apple Jelly.

Methods of preparation of some of these are briefly given elsewhere.

VII. Candied Fruits :—

Orange peel and Bers (Ziziphus Jujubee) :—After a great deal of experimental work extending over a number of years, a highly satisfactory method of candying the above has been developed. It consists in fermenting the material in brine over a period of about a month and then candying the fruit by the addition of a known amount of citric acid in the candying syrup by usual progressive increase of sugar content of the syrup at a constant temperature of about 140 to 150°F. This method dispenses with the use of glucose or glucose syrup (as invert sugar is formed in the syrup by the acid) and also renders the fruit or peels sufficiently porous—a condition which permits complete impregnation of syrup into the fruit tissues.

VIII. Unsweetened Juices :—

(i) **Unfermented apple juice.**—Problems involved in the clarification, preserving etc., have been studied in detail, and a

satisfactory product has been made as described elsewhere.

Work on the following juices has been done and satisfactory products have been obtained:—

- (i) Lime Juice (pure clarified and unclarified).
- (ii) Grape juice.
- (iii) Jaman Juice.
- (iv) Falsa Juice.

IX. Drying and Dehydration of Vegetables.

(i) The following vegetables have been dried in the sun.—(1) Sarson ka sag; (2) Spinach; (3) Cauliflower; (4) Turnips; (5) Cabbage; (6) Peas; (7) Okra; (8) Bitter gourd (Karela); (9) Tindas.

It has been found that the quality of the sun-dried vegetables deteriorates considerably during one year's storage. From these results, it was evident that sun-drying in the case of these vegetables is not successful.

WINNER of SEVERAL FIRST PROVINCIAL PRIZES

Genuine Blood Red Malta Plants are available
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پنجاب فروٹ نمائش میں کئی ایک اول انعام پانے والے سرخ مالٹا
کے پودے بخشی کنھیا لال ایڈوکیٹ میونسپل کمشنر گوجرانوالہ کے باغ سے
خرید کریں۔ مالٹا کا پھل دسمبر و جنوری میں ملاحظہ فرما سکتے ہیں۔

While replying please mention the Punjab Fruit Journal.

(ii) **Dehydration.**—Methods have been standardized for dehydrating the following vegetables by artificial heat:

(1) Potatoes; (2) Cauliflower; (3) Onions; (4) Peas; (5) Bitter gourd (Karela); (6) Okra; (7) Brinjal.

The quality of these dehydrated vegetables does not show any deterioration during storage.

X. Experimental work on the standardization of the following products is in progress :—

1. Citrus by-products like:—

(a) Citric acid; (b) Alkali citrates like Calcium and sodium citrate; (c) Citrus oils—orange and lemon oil.

2. Bottling of pure orange juice by blending it with plum juice; (3) Plum beverages. (4) Apple cider. (5) Vinegar from waste dates. (6) Preparation of distilled vinegar. (7) Passion fruit squash. (8) Banana flour. (9) Perry

(cider from pears). (10) Preparation of starch and gloy from waste potato starch in the dehydration of potatoes. (11) Canning trials on fruits like peaches, plums, apricots and pears grown in U. P. (Saharanpur and Chaubattia, Kumaon Hills) and Kashmir. (12) Standardization of a commercial Tunnel dehydrater (this is already working in full swing).

In addition to the above, a large number of enquiries on fruit and vegetable preservation from all over India are attended to. A large number of visitors are shown round the laboratories. Analytical work connected with the samples received from the Supply Department is attended to.

XI. Other activities in Fruit and Vegetable Preservation.

Semi-commercial trials have been conducted in the Canning Hall and Juice plant on the products standardized so far in order to work out the cost of manufacture.

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BLOODRED MALTAS
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POPULAR NURSERIES & FRUIT FARM,
GUJRANWALA (Pb.)

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گوجرانوالہ کے مشہور
سرخ مالٹا کے پوتے

سنگترہ مالٹا کی قسم کے پودہ جات کی خرید کیلئے
محکمہ ہائے زراعت پنجاب اور شمال مغربی صوبہ سرحد سے
منظور شدہ اور پنجاب فروٹ نمائش میں اول درجہ و
دیگر انعامات حاصل کرنے والا، سائنس کے اصولوں پر
قائم کردہ اور بڑے پیمانہ کا قابل اعتماد ذخیرہ (نرسری)۔
— تشریف لائیے اور ملاحظہ فرمائیے۔
دیگر تفصیلات و نرخ نامہ مفت طلب کیجئے۔
دی پاپولر نرسری و فروٹ فارم گوجرانوالہ پنجاب

A Directory of Approved Nurseries, Seed Houses and Gardening Firms

With a view to place before the fruit growing public of various provinces a list of reliable Nurseries, Seed Houses and Gardening Firms, the Punjab Fruit Development Board introduced the registration scheme recently, details of which have already been published in the October 1940 issue of this journal. The criterion of reliability, fixed by the Board, is that the firm concerned must be able to procure a favourable report from the Agricultural Department of the Province to which it belongs.

Under this Scheme the following firms have so far been registered and they guarantee to supply reliable healthy plants, seeds etc. viz., true to parentage and free from insect and fungus pests.

PUNJAB Nurseries

1. Messrs. Brij Lal Orchards, Pathankote.
2. The Manager, Jamalpur Fruit Farm, via Sarna Rly. Station, near Pathankote.
3. Messrs. Popular Nurseries and Fruit Farm, Gujranwala.
4. Messrs. Indian Mildura Fruit Farms, Ltd., Renala Khurd, District Montgomery.
5. Bakhshi Kanhya Lal, Advocate, Gujranwala.
6. The Manager Feroze gardens and Nurseries, village Mahmud Buti, near Hydro-Electric Power Station, Shalimar, Lahore.
7. S. Kartar Singh Dewana, Dewana Fruit Farm chak No. 370, Sardarwala, P. O. Parkarbad district Sheikhupura.
8. M/s. B. B. Bannerji and Sons, Nurserymen, Saraswati Gardens, Simla E.
9. Bakhshi Garden, Nurpur (Railway Station) Nurpur Road, District Kangra.
10. Khalsa College Nursery, Amritsar.

11. The Nazir Nurseries and Fruit Farm, Gujranwala.

12. Ch. Siraj Din, Plant Seller, Lawrence Road, Lahore.

13. Kot Ganesh Das Farm, Mian Channu, District Multan.

14. Parkash Nursery, Muzaffargarh, Punjab.

15. Sardar Garden Nursery, Village and Post Office Chak No. 17/1 A. L., Sardarpur (Tehsil Okara District Montgomery).

16. Mushtaq Gardens and Nursery, Mian Channu.

U.P.

Nurseries

1. Messrs. L. R. Brothers, Saharanpur.
2. Henbane Nursery, Saharanpur.

BIHAR

Nurseries

1. Messrs. Raghunandan Sah and Sons, Govindpuri, Muzaffarpur.

BOMBAY

Seed Houses

1. Messrs. Pestonji P. Pocha and Sons, 8, Napier Road, Poona.
2. Messrs. N. Cooper and Co., 21, Wellesley Road, Poona, 1.

Nurseries

3. Messrs. Garden Supplies Co., Ville Parle, Bombay.

MADRAS

Nurseries

M/s. E. R. Sampanji and Sons, Lalbagh, Fort Road, Bangalore city.

S. K. I. Kadir Meera Sahib, Head Nursery, Salem (S.I.).

Gardening Firm

1. M/s. Standard Furniture, Co., Kalai, Malabar (India).



Classified Directory of Firms Supplying Fruit Products and Fruits

With a view to place before the public a list of the important canners and others connected with the fruit preservation industry, this section is being introduced from the present issue. Advertisements under this head cost Rs. 5/- per insertion for a matter not exceeding 6 lines (each line not exceeding 6 words). While writing to advertisers, the Readers are requested to write legibly and quote that they are writing in response to advertisement in the Punjab Fruit Journal. This would ensure prompt attention.

PUNJAB FIRMS

1. **The Glacier Products (India) Patankot.**—Manufacturers of high class fresh fruit Squashes comprising of Orange, Lemon, Lime and Mango Squashes, Lime Juice Cordial, Tomato-Juice, Lemon Barley Water and Orange Marmalade.

2. **S. A. Rahman and Sons, Lahore.**
Established 1905.

Manufacturers of Jams, Jellies, Marmalades Squashes, crystallised fruits, Chutney, Pickles and confectionery etc.

3. **Bakhshi Kanhaya Lal Garden, Gujranwala.**—Bakhshi Kanhiya Lal Garden, Gujranwala, Winner of Several First Provincial Prizes in various Punjab Fruit Shows.

BLOOD RED MALTAS A SPECIALITY

Suppliers of the choicest fruits for juices and canning purpose. Also maintains Nursery approved by the Government.

4. **The Indian Pure Food Products, Gojra.**—Indian Pure Food Products, Gojra

(Punjab). Manufacturers of : Chenab brand Fruit and Vegetable Products, Specially, Orange squash, Lemon squash, Lemon Barley Water, Lime Juice cordial Tomato Juice, Tomato Ketchup, Mango squash, Orange barley water, Grapefruit squash, Orange marmalade and Mango chutney etc., etc.

BOMBAY FIRMS

Madhu Canning Company, Bombay.—14, Telegraphic Address : **EMOICI**, Bombay. Largest Canner of Mangoes, Marmalade, Vegetables, etc.

Join THE PUNJAB FRUIT DEVELOPMENT BOARD

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Punjab P. C. Fruit Development Board,
Punjab Agricultural College, **LYALLPUR.**

Telegrams: 'GLACIER' Pathankot



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RELIABILITY

For best and most reliable Fruit Nursery Plants and for
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BRIJLAL ORCHARDS, Pathankot.

Mango Grafts, Banarsi Amla, Sangtra, Litchies,
Malta—Our Speciality.

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While replying please mention the Punjab Fruit Journal.

The **PUNJAB FRUIT JOURNAL**

Vol. VI]

Lyallpur, April, 1942

[No. 22

About Ourselves

The unusual rise in the rate of paper—now of course this rate has been controlled by the Punjab Government—in the month of December last, when the special annual number of the Punjab Fruit Journal devoted exclusively to fruit and vegetable preservation was to be printed, had made it extremely difficult if not impossible to procure paper at a reasonable rate. But this, in no way, deterred us from bringing out the special Number which was almost double the usual size of ordinary issues and was to be supplied free of cost to the Members of the Board. For doing so we had to spend much more than could be expected under different circumstances.

Obviously, as a measure of economy, we had the intention that the April 1942 issue should not be brought out. But again to keep up the continuity of the Journal this idea was dropped and it was decided to bring this issue as well, though of a smaller size. The present Number contains, besides other useful articles the speeches delivered by distinguished personages on the occasions of the Annual General meeting of the Board and the Provincial Citrus Fruit Show both held at Lahore early this year.

(Editor)

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THE PUNJAB FRUIT DEVELOPMENT BOARD, LYALLPUR

While replying please mention the Punjab Fruit Journal.

Factors Responsible for Intensity of Red Colour in Bloodred Oranges

By

Lal Singh, B.Sc. (Hons),

M.Sc. (Calif.),

Fruit Specialist, Punjab, Lyallpur.

And

Abdul Aziz Khan, B.Sc. Agri. (Pb.),

Ph.D. (Bristol)

Fruit Section, Lyallpur.

Although area under citrus fruit in general is increasing very rapidly in the Punjab and many kinds of citrus trees, especially malta, sangtra, grapefruit, limes and lemons, are being planted, yet Bloodred varieties of malta have caught the imagination of people to such an extent that indents for Bloodred plants in Government nurseries easily account for two-thirds to three-fourths of the total indents of all kinds of citrus plants put together. An idea of the extent of demand for Bloodred orange can be had by the fact that, before the advent of Government nurseries, the price of Bloodred malta plants was easily three to four times the price of ordinary malta plants. Growers are planting Bloodred orange because of the extreme popularity of this fruit, amounting to almost a craze, in the general public which is ready to offer twice, thrice or even more price for a Bloodred variety as compared with other varieties of malta.

Market value of a fruit naturally depends upon its quality which in the case of citrus fruits includes such characteristics as size of fruit, its uniformity, appearance, freedom from blemishes, colour, smooth surface, thickness of peel, colour and texture of flesh, amount of fibre, flavour, taste,

sugar and acid contents, etc. Within the Bloodred group, there are several varieties and strains which produce fruits of red flesh and vary considerably in the characteristics mentioned above. But one factor which appeals to the consumer more than anything else and which puts high premium on Bloodred fruit, is the intensity of red colour in the flesh. There is, however, one riddle or mystery which has always perplexed both the grower and the consumer. A malta tree, alleged to be of Bloodred variety, may bear some fruits which may exhibit no red colour in flesh at all, with the result, that a grower is inclined to accuse the nurseryman for supplying him plants of other than a Bloodred variety. Similarly a fruit seller in the market is sometimes accused of supplying maltas other than Bloodred in case some of the fruits supplied by him do not show red colour.

In order to solve this riddle, investigations were started in 1939-40 which involved the examination of about 1900 fruits on twenty Bloodred orange trees in five gardens, scattered throughout the important citrus growing tracts of the Province. In 1940-41, 960 fruits on ten trees in four gardens were utilized for the investigations.

The method of study was to divide each tree into four sectors, i.e., North-West, South-West, South-East and North-East by the help of a compass. Each sector was again sub-divided into two sub-sectors, i.e., (a) lower half portion of the tree and (b) the upper half portion of the tree. Then from each sub-sector, about a dozen fruits were taken for observation, half of which were removed from the exposed portion of the tree and the other half from places where they were shaded by the leaves. Each fruit was cut into two halves transversely and the amount of redness in the pulp recorded. The method of recording colour development was to count the total number of segments as well as those which developed colour, in each half of the fruit and calculate the percentage number of coloured segments. In the case of partially coloured segments, the extent of coloured portion was measured and percentage figures worked out accordingly. The intensity of colour was not taken into account as it was almost always positively correlated with the amount of pulp of red colour, i.e., greater the volume of the pulp of red colour the more intense was the

colour. For example a fruit with 50 per cent coloured flesh had more intense colour than the one with 25 per cent coloured flesh.

The trees on which observations were taken were of two groups. One group constituted those trees which were exposed to sun from South-Eastern and South-Western sides and the second group comprised those which were protected from these sides against sun heat, by the shade of 'Jantar' trees.

'Jantar' is hardy, very quick growing and provides excellent shade in hot summer months. Jantar is also leguminous and hence does not impoverish the soil to any great extent.

The mean data collected in 1939-40 at all the places on all trees, protected and unprotected from sun, under the experiment are consolidated in the following table to economise space. The data of individual tree in each year at each place also tells the same story.

TABLE.

Showing the development of colour, expressed in percentages, in Bloodred orange fruits borne on different sides of the tree.

Protected or unprotected trees.	Side of the tree.	LOWER HALF OF THE TREE.		UPPER HALF OF THE TREE.	
		Shaded fruit.	Exposed fruit.	Shaded fruit.	Exposed fruit.
Trees unprotected from South-Eastern and South-Western Sides.	North-West.	76	73	67	62
	North-East.	79	73	71	61
	South-East.	54	23	42	12
	South West.	36	14	25	4
Trees protected from South-Eastern and South-Western Sides.	North-West.	89	79	83	80
	North-East.	92	87	82	78
	South-East.	72	62	63	52
	South-West.	64	54	57	43

From the above table and other observations made, the following conclusions are drawn :—

1. The fruit on North-Western and North-Eastern sides developed far better colour in its flesh than that on South-Eastern and South-Western sides of the trees. This difference was almost fifteen times in the case of exposed fruit on the upper half of the exposed tree when South-West side was compared with N. E. and N. W. sides of the same trees. This is because the fruit on South-Eastern and South-Western sides is exposed to the hot rays of the sun in the afternoon.

2. The fruits on South-Eastern side were better coloured than those on South-Western sides. This is probably due to the reason that fruits on South-Eastern side remain less exposed to sun in the afternoon than those on South-Western side.

3. The fruit on the lower half on the trees developed better colour than that on the upper half of the tree this difference being less marked on North-Eastern and North-Western sides but more marked on South-Eastern and South-Western sides. This can be partly due to the reason that fruit on the upper half of the tree is more exposed to the sun than that on the lower half of the tree.

4. On the South-Eastern and South-Western sides of the trees, shaded fruit developed better colour than the fruit exposed to the rays of the sun.

5. The quality of shaded fruit in regard to its colour development on North-Eastern and North-Western sides was better than that of the shaded fruit on the South-Eastern and South-Western sides.

6. Reference to the performance of trees protected against sun on the S. E. and S. W. sides by 'Jantar,' it is clear that they developed better colour in their fruit on these sides than those trees which were not similarly protected. The exposed fruit on South-Eastern and South-Western sides in the lower half of the unprotected trees developed only 23 and 14 per cent colour respectively, against 62 and 54 per cent

colour in the case of protected trees. The same is true of the exposed fruit in the upper halves of the protected and unprotected trees, the difference being four to ten times in favour of protected trees.

7. Though considerable improvement in the quality of exposed fruit on South-Eastern and South-Western sides of the trees was effected by providing shelter against sun, yet protected fruits on these sides did not come to the same standard as the shaded fruit on the other two sides.

8. Fruit borne in the interior of the trees which could not get any direct or indirect light during any part of the day did not develop any red colour. It was big in size, insipid and had very thick peel. The bearing in the interior of the trees was, however, very small.

9. The fruit that was exposed to the hot rays of the sun in the afternoon not only failed to develop redness in its flesh but was found to be poor in quality in other respects as well. It was thick skinned, less juicy and had plenty of rags. It lacked in proper sweetness, acidity and flavour characteristic of the variety.

From what is given above it is quite clear that hot rays of the sun falling on the fruit in the afternoon are responsible for poor quality fruit and lack or absence of redness in its flesh. Fruit growers in the Punjab plains and other hot places are, therefore, advised to plant 'Jantar' trees on the South-Eastern and South-Western sides of Bloodred orange trees to provide shade in the afternoon to the fruit borne on these sides and thus obtain better quality fruit. 'Jantar' (*Sesbania egyptica*) is planted in early spring, which attains sufficiently big size during the summer of the next year to provide shade to citrus trees. Once it is established it provides almost permanent shade for several years. It will be better if its roots are kept in check to avoid competition with citrus root system. This is best accomplished by occasionally cutting down its roots extending towards the fruit trees at 4-5 ft. distance from the trunks of citrus trees.

Double Wari for Small Fruit Growers

By

S. Satwant Singh, Rais,

Bara Farm, Distt. Montgomery.

To safeguard the interest of the small fruit growers, the Government have very kindly reserved $\frac{1}{4}\%$ of the total culturable area (i.e., half of the area for which extra water provision is made) for supplying double wari to small gardens. The canal authorities point out that if there is an increase of less than 18 acres on a particular outlet, the double wari cannot be sanctioned, because the increase in the size of the outlet is so negligible that in actual practice it is impossible for them to make any appreciable increase in the size of the outlet. Therefore, they insist that until the small fruit growers pool together and plant at least 18 acres on a particular outlet, none of the individual small fruit growers can get extra wari unless he obtains the written consent of the other shareholders of the outlet.

About a year and a half back the Government very kindly sanctioned the supply of double wari for orchards, but since then it has not been possible for the small fruit growers to take advantage of this concession because they have not the capacity to plant, individually an area of 18 acres or more of gardens at a stretch nor are they able to obtain the written consent of the shareholders. If small fruit growers are to be encouraged to plant an area of 2 or 3 acres of garden, it is essential, that this handicap should be removed.

The canal authorities provide watering facilities for factories, tanks, leather tanneries and village 'abadis' without making any extra provision in the outlet for the water thus supplied and they also charge Abiana for the same.

In the Abadkar and Fouji Chaks where the 'Kamins' are given a square of land, they are provided with double wari, while from the outlet, the square allotted to the 'Kamins' is not given any extra wari. For watering trees along District Board and other roads water is provided from the adjoining outlet, without increasing the size of the outlet. The Executive Engineer has been given certain powers by which he can provide extra water in the Warabandi without increasing the size of the outlet, wherever he thinks the exigencies of the situation so demand.

Just as it is done in all the above-mentioned instances, if the canal authorities sanction double wari for small orchards of 2 or 3 acres, in a few years' time, other co-sharers will also go in for small orchards and the area will reach the figure of 18 acres when it will be a practical proposition for the Irrigation authorities to increase the size of the outlet. Further it would be desirable if the Irrigation authorities do not insist on a prospective small fruit grower getting the consent of other co-sharers of the outlet. When a small fruit grower is given extra wari for planting 2 or 3 acres of garden, his co-sharers will also try to emulate his example and take the same advantage in due course. Thus, in a few years' time, the particular outlet, on which extra wari was given only on 2 or 3 acres at the first instance, would have at least a fairly large area to justify a modification in the outlet.

Canning of Green Grams

By

G. L. Tandon, M.Sc., Lecturer in
Fruit and Vegetable Preservation,
Punjab Agricultural College, Lyallpur.

It has long been recognised that green gram is a nutritious and popular food in this country. In view of the fact that the duration of the soft green stage of the crop is extremely short, attempts at preserving green gram by canning with special reference to retention of freshness, colour and taste have been found feasible. However it must be observed that much of the success in canning green gram depends upon the variety used.

The method of canning green gram is summarized below for the benefit of the readers :—

1. Varieties suitable for canning.

- (a) The white Kabuli variety with large size grains.
- (b) The white Kabuli variety with small size grains.

Both these varieties when dried in the ripe stage are creamy white in colour. To distinguish these varieties, in the field, from other varieties of grams one has to look for the lighter green colour possessed by the Kabuli varieties as against the darker green colour of other known varieties of the Punjab. As regards the canning qualities both the varieties having large as well as small grains are quite suitable.

2. Canning process.

(i) **Shelling**—Can be done by hand quite easily. None of the machines hitherto used for peas, etc., are adaptable to the shelling of this raw material.

(ii) **Grading and sorting**—It is easy to train the workers to sort out over-ripe and discoloured or diseased grains even while shelling. Grading according to the size of

the grain may also be profitably undertaken while shelling.

(iii) **Blanching**—The sorted and graded grains are tied in a muslin cloth and dipped in boiling water for 4 to 5 minutes after which these are plunged into cold water thus ensuring a rapid cooling.

(iv) **Filling**—Plain cans are used of any desired size, and the grains are filled leaving a head space of $\frac{1}{2}$ " from the top.

(v) **Brining**—A mixture of an aqueous solution of 2% common salt and 2% white refined sugar is poured into the cans leaving a head space of $\frac{1}{4}$ " from the top.

3. Exhausting.

The cans are covered with lids and placed upright in a vessel with boiling water, maintaining the water level in the vessel upto $\frac{1}{2}$ " below the tops of the cans. A2 and A2½ cans should be exhausted for five minutes and six minutes respectively. The cans are sealed air tight immediately after exhausting.

4. Processing.

The sealed cans are placed immediately in a pressure cooker. A2 cans are processed or sterilized for 40 minutes at 240°F. with 10 lbs. per sq. inch pressure, whereas A2½ cans are processed at the same temperature and pressure for 45 minutes.

5. Cooling.

The cans are removed from the pressure cooker and cooled in running water until quite cool. The cans are wiped dry and stored in a cool dry place.

Chronicle of the Fruit World (Indian Section)

By

K. L. Kohli, M.A., L.S.G.D.,

Asstt. Secretary,

Pb. P. C. Fruit Development Board,

Lyallpur.

1. War Time Drive to Food Preservation.

In order to secure easily transportable supplies of food and in a form which will keep them intact in any climate, the Supply Department created a Food Directorate in 1940 with which the Imperial Council of Agricultural Research has been working in collaboration.

A modified scheme suggested by the Council was sanctioned for a period of one year. It was located at the Punjab Agricultural College, Lyallpur, where there was already a Food Preservation Section. The main functions of this Section are:—

- (a) to analyse samples supplied by the Supply Department, report on these and advise as to what is needed to bring them up to Army requirements;
- (b) to undertake research, if necessary;
- (c) to train staff for employment in approved factories, if necessary;
- (d) to ascertain the types and quantities of different types of fruits required for canning;
- (e) to undertake semi-commercial trials of formulae and processes at the instance of the Supply Department or otherwise;
- (f) to advise the Supply Department regarding the manufacturing cost of the products with a view to fixing a reasonable price.

Provinces and States were also invited to put up auxiliary schemes for canning and preservation. Food preservation, both in peace and war, was considered by the Fruit Committee of the Imperial Council of Agricultural Research in its meeting in April, 1941. The meeting was attended by representatives of the existing canning industry in India.

(Drying of Vegetables.

Another subject which has assumed importance, as much as canning, is the drying of all kinds of vegetables. The process evolved at Lyallpur has produced dried vegetables which are satisfactory both in quality and appearance and which give first class articles on subsequent cooking.

[A large tunnel dehydrator was designed by the Fruit Specialist, Punjab, and constructed at the Lyallpur Agricultural College Workshop. It was standardized and its final design and the standard method of using it was given out to the commercial concerns which were interested in the subject.—Ed.]

The Imperial Council of Agricultural Research has also financed a scheme in Quetta for research in canning and fruit preservation. Drying of fruits is included in the technical programme and the following results have so far been obtained:

- (1) shade drying of kishmish grapes has given an excellent dried product;

- (2) a bleached dried product prepared from Haitha grapes has been found to be successful;
- (3) methods have been evolved for drying apricots, peaches, pears and apples.

Foodstuffs.

Among the new items now being produced for the first time and supplied in large quantities to troops overseas are dehydrated potatoes, canned tomatoes and other vegetables, dried and canned fruits, canned curries, golden syrup, margarine, essence of chicken, and ascorbic acid tablets.

Besides these, India is a large source of supply for practically every kind of foodstuffs including curry powder, mustard, sauce, pickles, jams, jellies, marmalade. Indigenous sources of supply for cornflower, salad oil, vinegar, tomato ketchup, fruit essences, hard cured bacon and sausages have also been traced, and these are being obtained in increasing quantities.

The dehydration of vegetables, such as cauli-flower, carrots, turnips, parsnips, cabbage, onions, brinjals, okhra and tomatoes, has also been taken in hand. It is proposed to bricket these vegetables in the form of small slabs to facilitate transport and rationing out to troops.—Indian Infor-

mation, February 1, 1942, pages 141, 119 and 83.

2. Province-wise Fruit & Vegetable Acreage of the British Indian Provinces.

The following statistical table embodying area in acres under fruits and vegetables (including root crops) in the British Indian Provinces is being reproduced from the Brochure 'Fruits and Fruit Products Exhibition held in January 1942 at Calcutta.

Provinces :—Ajmer-Marwara 1,905, Assam 462,609, Bengal 815,600, Bihar 434,400, Bombay 202,617, C. P. and Berar 139,955, Coorg 9,900, Delhi 5,685, Madras 691,505, N.-W.F. Province 36,741, Punjab 240,321, United Provinces 578,874, Orissa 150,222, Sind 45,726.

Total :—3,816,061 acres.

3. Statement showing Indian Import and Export figures of fruits and vegetables.

Figures relating to the huge quantities of fresh fruits, vegetables and fruit products imported and exported for India are being re-produced from the Brochure on Fruit and Fruit products Exhibition held in January 1942, at Calcutta. These figures throw a flood of light on the situation making legislation imperative to check this menace of foreign competition particularly with regard to imported fruit products :—

(a) Import of Fruits and Vegetables into India.

1936-37 value	1937-38 value	1938-39 value
Rs. 1,54,49,000	Rs. 1,58,23,000	Rs. 1,34,43,000

(b) Export of Fruits and vegetables from India.

1936-37 value	1937-38 value	1938-39 value
Rs. 1,97,13,000	Rs. 2,08,19,000	Rs. 2,26,86,000

(c) Import of fresh fruits into India.

1936-37 value	1937-38 value	1938-39 value
Rs. 8,48,989	Rs. 9,65,268	Rs. 10,69,905

(d) Export of fresh fruits from India.

1936-37 value	1937-38 value	1938-39 value
Rs. 2,06,135*	Rs. 9,31,265	Rs. 7,91,317

(e) Import of fresh vegetables (including Potato) into India.

1936-37 value	1937-38 value	1938-39 value
Rs. 10,14,269	Rs. 39,07,105	Rs. 36,06,979

(f) Export of fresh vegetables (including onions) from India.

1936-37	1937-38	1938-39
value	value	value
Rs. 30,86,280	Rs. 44,49,874	Rs. 40,43,338

(g) Import of fruits, nuts and vegetables into India from Afghanistan.

1937-38	1938-39	1939-40
value	value	value
Rs. 98,46,000	Rs. 1,06,28,000	Rs. 88,57,000

(h) Import of dried, salted or preserved fruits and vegetables into India*

1936-37		1937-38		1938-39	
Quantity	Value	Quantity	Value	Quantity	Value
Tons	Rs.	Tons	Rs.	Tons	Rs.
88,885	1,11,96,392	92,761	1,09,51,059	82,036	87,66,296

(i) Export of dried, salted or preserved fruits and vegetables from India**

1936-37		1937-38		1938-39	
Quantity	Value	Quantity	Value	Quantity	Value
Tons	Rs.	Tons	Rs.	Tons	Rs.
18,339	1,36,88,943	22,924	1,48,38,846	31,137	1,61,12,190

* Exclusive of canned or bottled fruits and vegetables.

** Exclusive of Coconut figures for Madras.

4. Formation of Indian Fruit Preservers Association.

The inaugural meeting of the newly formed Indian Fruit Preservers Association was held on January 31st, February 1st, 1942. Mr. R. Mitchell, Director of The Indian Mildura Farms Ltd., Renala Khurd (Punjab) and Mr. Krishna Prasad Bhargava, Proprietor, G. G. Fruit Preserving Factory, Agra (U. P.) were elected President and Secretary respectively of the association for the coming year.

5. "The Horticultural Society of India."

An all-India Society of horticultural workers has been formed from January 1, 1942 with the purpose of advancing the cause of horticulture and horticultural sciences in India, by publishing an horticultural Journal (Proceedings of the Society) and horticultural literature; by holding annual general meetings at the various horticultural centres, by rotation, and local meetings and facilitating intercourse between members; by encouraging original investigation; and by organising efforts to create facilities for horticultural work in the country. Membership is open to persons interested in any field of horticulture and horticultural sciences. Pending appointment of the office-bearers by general election an ad hoc Organising Committee has been formed with

Dr. G. S. Cheema, Horticulturist to Government, Bombay, Poona, as Chairman, and Dr. P. K. Sen, Horticulturist, Bihar, Sabour, as Secretary.

6. A Modern Fruit and Vegetable Market for Delhi.

According to the report of the Civil and Military Gazette, Lahore, dated 19-2-1942, His Excellency Lord Linlithgow, Viceroy, performed the opening ceremony of the new fruit and vegetable market for Delhi constructed by the Delhi Improvement Trust.

7. Commendable Marketing Activities of the Kodur Fruit Growers' Co-operative Society (Madras Presidency).

The Kodur Fruit Growers' Co-operative Society is undertaking from 1-8-1941 one of the important functions of grading oranges at two important fruit growing areas, and from these ware houses directly consign them to Moffussal areas. The cheap, simple and efficacious 'Kodur Chineer grader' devised at the Fruit Research Station, Kodur, which helps to grade the fruits into four sizes, namely, 2¾", 3", 3¼" and 3½" will be used. The grading station will also help to teach the growers the proper methods of harvesting, gathering, culling, grading and packing. In certain big areas like Nagavaram and a num-

ber of villages the entire produce goes through the Kodur Fruit Growers' Co-operative Society. Temporary advances are made by way of loans. The society has established fruit sale depots at Anantapur, Hindupur, Bangalore and Hyderabad. But the bulk of the produce goes to Madras from where the fruits are further consigned to southern districts like Madura, Tanjore, Trichy, etc. The progress of work done by the society during the year 1940-1941 is as follows:—

Particulars.	Baskets.	Gross sales.
1. Oranges - - -	36,095	
2. Mangoes - - -	2,561	
3. Limes - - -	802	
4. Melons - - -	1,763	Rs. 1,63,408.
5. Sapotas - - -	10	
6. Pineapples - - -	184	
7. Betel leaves - - -	30,418	

The society addressed the M. S. M. Railway authorities and got concessional rates for oranges to Madras, Bangalore, Anantapur, Hindupur and Hyderabad stations. The society is also moving the S. I. R. and M. S. M. Railway authorities to grant concessional rates to all important towns in South India.—Madras Agri., October 1941, page 386.

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While replying please mention the Punjab Fruit Journal.

Presidential Address

delivered by

*The Hon'ble Chaudhri Sir Shahab-ud-Din,
President of the Punjab Fruit Development Board,
at the Seventh Annual General Meeting of the Board
held at the Y. M. C. A. Hall, Lahore
on 7th January, 1942.*

Hon'ble Mian Abdul Haye and Gentlemen,

As the President of the Punjab Fruit Development Board for the last seven years, it is my proud privilege to extend to all of you, especially to the Chief guest, the Hon'ble Mian Abdul Haye my heartiest welcome.

Year after year, I have been emphasising the boundless scope of the development of the national fruit industry in this "Land of Five Rivers." With its variety of climate, its fertile soil, its extensive irrigation system and its hardy peasantry, the canal colonies of the province can be converted into flourishing garden colonies which would favourably compete with the very best in the world. I have also previously referred to the informative chronicles of the fruit industry received from countries like California, Palestine, Italy, France, the Union of South Africa and Egypt, where this industry has developed with the planned state patronage

and public co-operation. I need not, therefore, this year dwell again on the legislative measures adopted by those Governments to develop and to consolidate this key-food industry and the steps which we could successfully take here in India.

There is no denying the fact, that the development of fruit industry in the Punjab would mean greater prosperity for the province, greater revenue to the Government, better health for its people and above all an encouragement to other allied industries like fruit and vegetable preservation, tin and glass manufacture, etc. No achievement, however, is possible in this industry unless the fruit growers are knit together in a strong co-operative organisation to protect their legitimate interests and to guide the industry along right lines under the kind and generous patronage of the Government. And it was

with this object that the Punjab Fruit Development Board was started in 1935.

Sir, with your permission, I may now make a brief review of the achievements of my Board and say a few words about its future aspirations, if given a strong support by the responsible and representative Government at this juncture.

I. PUBLICATION ACTIVITIES

The Punjab Fruit Journal, I am glad to say, has attained the reputation of an all-India Periodical. The popularity of the journal amongst the public at large can be judged from the fact that out of 21 issues published so far, including seven special numbers, as many as ten are out of stock and there is a heavy demand for the rest.

The growing importance of this journal—spokesman of Indian horticulture—is well acknowledged from such far of renowned academic circles as the California University, U. S. A., the Imperial Bureau of Horticulture and Plantation Crop East Mailing Research Station, England, down to the unknown school in the remotest corner of the province. The annual numbers of the journal have won unstinted admiration from such connoisseurs as Dr. W. Burns, Agricultural Commissioner with the Government of India and the widely circulated discriminating Indian Press.

With a view to disseminate horticultural knowledge amongst Urdu reading public, the Urdu section of the Journal which was formerly combined with the English section, has been issued as a separate edition since January 1941, without any consideration of the labour and expenditure involved.

For want of funds, the Fruit Journal has not only to economise at every step and most of the work is got done on honorary basis, but many a time illustrated articles, which can prove extremely useful, have also been withheld. Any help that you, Sir, may be able to extend in this direction would be highly appreciated.

In my opinion, the Education Department can render considerable help to the Board by asking all the Government and State-aided educational institutions to subscribe to either of the editions of the journal so as to keep the students in closer contact with the national fruit industry of the Punjab. In this connection, I may mention that the Director of Public Instructions, Punjab, has already approved the Journal for use in schools.

Another way in which your Department can do immense service to the fruit industry and the public at large, is by popularising not only fruit gardening in rural schools, but also by encouraging the art and science of fruit preservation in all girl schools and colleges which should prove an immensely useful subject for them. By introducing a course of fruit and vegetable preservation in our girls' schools and colleges, we shall be imparting practical training in a subject of great importance. If fruit and vegetable preservation is popularised as a cottage industry it will bring about a higher standard of living, the removal of gluts in the market, better price of raw material for farmers and above all, a happy pastime for our womenfolk.

II. BUD SELECTION-CUM-NURSERY PROGRAMME

This is a promising scheme which aims

at locating trees of outstanding merit in various gardens, year after year, and taking budwood from the same for propagation of nursery plants for supply to members. The modern horticulturist is not content with merely planting trees of any particular variety but wants the best trees produced from a pedigree stock.

The management of the Board felt that this highly useful programme could not be ignored and started the same two years back. So far, we have been able to locate about 1450 citrus, mango and plum peach trees of merit in various parts of the province; and have also set up branch nurseries in five fruit producing centres of the province and a central nursery at Lyallpur. We distributed last year, altogether, 7527 citrus and 716 mango plants. This is by no means a disappointing record especially when the scheme had to face many financial difficulties.

On the occasion of last year's Annual Meeting, the Hon'ble Sir Manohar Lal, Minister for Finance, Punjab, was pleased to remark that a small subsidy of Rs. 5,000 per annum which had been asked for developing this scheme, was uncommonly modest and could be granted without any difficulty. But I am sorry to say that nothing tangible has so far been done in this direction. We are as we were last year. Once again, we approach through you, the Hon'ble Minister for Development and the Hon'ble Minister for Finance to secure us this financial aid and thereby help us in running the programme successfully.

III. IRRIGATION FACILITIES

As a result of representations made by the Board for several years, the Irrigation Department was pleased to sanction

last year double *wari* for gardens, and I am glad to say that over a thousand fruit growers have already applied for this concession. Its working has, however, brought to light some serious defects. There are also several other grievances of the fruit growers which require to be redressed. Since detailed representation on the subject is already being made and a deputation will wait shortly on your worthy colleague, the Hon'ble Chaudhri Sir Chhotu Ram, Minister for Revenue, Punjab, I need not dilate on this subject here.

IV. MARKETING ACTIVITIES

Any policy aiming at horticultural development cannot succeed without suitable arrangements for marketing. Undertaking of this programme at this moment, would be another contribution to put a stop to the malpractices prevalent in the fruit markets of the province which at present are controlled by a small number of fruit 'arhtias' and where the trading practices which prevail are too old and present a sharp contrast to the canons of fair dealing which we find in modern business.

The Executive of the Board framed a number of marketing schemes in consultation with the Marketing Officer, Punjab, but these schemes could not be put into practice for lack of funds and for want of a proper marketing site at Lahore. However, it is hoped that with the building of the Lahore Municipal Wholesale Fruit Market, the Central Co-operative Fruit Marketing Programme would be carried out successfully. The Board offers its fullest co-operation to the Administrator, Lahore Municipality, in making the proposed market a success. It is hoped that the Punjab Fruit Development Board would be given a suitable site, free of rent,

to enable it to start its activities both in the interests of producers and consumers and to serve the cause of fruit industry.

V. ADVISORY FACILITIES

A small start, I understand, is already being made by the Department of Agriculture. I take this opportunity of offering the fullest co-operation of the Fruit Development Board to the Department in this work which is of the highest importance. There is hardly any other branch of agriculture in which right advice at the right time is more essentially required than in fruit gardening, as mistakes once committed cannot be rectified except at enormous loss. In U. P. the Government have entrusted the advisory work largely to the U. P. Fruit Development Board which is given a grant for this purpose. A similar grant of Rs. 5,000 per annum to this Board from the Ministry for Development for supplementing the departmental activities by creating a net work of trained 'malies' in the districts to demonstrate horticultural operations for the benefit of members and others will be highly welcomed.

VI. FINANCES

The financial position of the Board continues to be as poor as it was last year. The proposed Fruit Cess Bill, if passed in the Assembly, would to a considerable extent, pave the way for strengthening its position. In this respect I would like to recapitulate the memorandum signed by sixty M. L. As. in 1939 and forwarded to the Hon'ble Minister for Development strongly recommending the grant of liberal

subsidies to the Board and other reliable bodies of its kind.

VII. ACKNOWLEDGMENT

I take this opportunity of offering my heartiest thanks and sincerest regards to our new Patron—His Excellency Sir Bertrand James Glancy, K.C.S.I., K.C.I.E., I.C.S., Governor of the Punjab and the Hon'ble Sardar Dasaundha Singh, Minister for Development, Vice-Patron of the Board, and cherish the hope that under their patronage, the Board would take rapid strides in serving the cause of fruit industry. My thanks are also due to Mr. F. L. Brayne, Financial Commissioner for Development, Mr. H. R. Stewart, Director of Agriculture, Punjab, and the members of the Managing Committee and various sub-committees who have devoted their valuable time, at considerable personal inconvenience in making the activities of the Board a success. In the end, on behalf of the Hon'ble Mian Abdul Haye and members of the Board, I offer my heartiest congratulations to S.B. S. Lal Singh on being given the personal distinction of 'Sardar Bahadur' in recognition and appreciation of meritorious services rendered by him to the province as the Hony. Secretary of the Board and the Fruit Specialist Punjab. I also appreciate the services of our young Assistant Secretary of the Board, Mr. Kohli, who has all along been of great assistance to me in the day to day disposal of the work of the Board.

Before I conclude, Sir, I must thank you sincerely for accepting our invitation to preside at this function.

Annual Report

of the
Punjab P. C. Fruit Development Board
for the
year ending 31st December, 1941

by
S. B. Sardar Lal Singh, B.Sc. (Hons.),
M.Sc. (Calif.), Hony. Secretary of the Board.

Mr. President and Gentlemen,

With the close of this year the Punjab Fruit Development Board has entered the 7th year of its eventful career.

As the President of the Board has made a general survey of the origin, aims, accomplishments and disappointments of the Board, I shall confine myself to state only the facts and figures regarding various activities of the Board.

COMMITTEE MEETINGS

During the year under report altogether 13 meetings were held :—

- Managing Committee meetings 3.
- Nursery Standing Committee 4.
- Publication Standing Committee 1.
- Finance Standing Committee 3.
- Fruit Marketing Standing Committee 2.

PUBLICATION ACTIVITIES

During the period under review 4 issues of the Punjab Fruit Journal were brought out in two separate editions—English and Urdu. The January 1941, issue was a special Annual Number. The number of

pages and items covered by these numbers is given in the following table :—

Issue	English Edition.		Urdu Edition.	
	Pages.	Items.	Pages.	Items.
January, 1941.	59	18	41	17
April, 1941.	60	13	64	12
July, 1941.	34	12	25	9
October, 1941.	41	16	27	10
	194	59	157	48

Despite the rise in the cost of paper and printing on account of war, the Punjab Fruit Journal has been regularly appearing and in fact, has come to enjoy a wide popularity. The experiment of splitting the Journal into two separate editions—English and Urdu—has also proved a success; and the January, 1941, inaugural Urdu Edition received good response, especially from the students. Out of 21 issues published so far, including 7 special Numbers, as many as 10 are out of stock

and the rest are going to be so. The present January, 1942, Fruit Preservation Number is yet another notable publication which is bound to receive a hearty welcome from people interested in this industry all over India.

The figures for the audited Fruit Journal Trading account for the year ending 30th September, 1941, which appear at the title cover, show a meagre profit of Rs. 64/-2. Besides, there is a Fruit Journal fund amounting to Rs. 1378/2/-, created out of previous surpluses, which stands intact to this date. The total number of subscribers (including members and associates) up till 15-12-1941 was 773, out of these 238 are from outside the British Punjab.

During the year under report S. Bal Singh, Dr. Girdhari Lal, Dr. Sham Singh, S. Harindar Singh, Dr. Abdul Aziz Khan, Mr. P. Maya Das, Mr. G. L. Tandon and M. Musahib-ud-Din, have been helpful to me in the publication of the English Edition of the Journal, and, S. Basant Singh, M. Abdul Hamid Khan, Mr. Ikram-ul-Haq for Urdu Edition, for which I feel grateful to them.

My sincerest thanks are also due to the external contributors, especially Dr. Khan A. Rahman, Entomologist Punjab and his staff, Dr. Swarn Singh, Vegetable Specialist Punjab, Mr. S. R. Varma, Horticulturist Patiala, and Mr. S. R. Swarup, Fruit Utilisation and Marketing Officer, U. P. I also appreciate the missionary zeal of our Assistant Secretary Mr. K. L. Kohli, as a successful News Editor-cum-Manager, for making the Journal a financial success even in these hard days. Untiring efforts of the rest of the staff of the Board in this direction also need commendation.

NURSERY SCHEME

The Nursery Scheme of the Board has been running quite successfully. During Spring and Monsoon, 1941, orders for 13491 citrus and 2213 mango plants were received but we could supply only 7527 citrus and 716 mango plants. Out of the total number of 3714 citrus

plants available for supply this season as many as 3280 were of Bloodred malta variety alone.

The budding activities at places like Mian Channu district Multan; Sardarwala, District Sheikhupura were consolidated and a new nursery at Chak No. 463 G. B. near Samundri District Lyallpur, was acquired on batai basis. Arrangements have also been made to acquire similar nurseries at S. B. Ujjal Singh's farm, Mian Channu, District Multan. Altogether 9793 citrus plants were budded in spring 1941 out of which 5790 were successful. *i.e. nearly 60%*

For the purpose of establishing a central nursery at Lyallpur, as site was acquired on lease where, in addition to the proper up-keep of 20,000 khati seedlings transplanted in Monsoon 1940, another lot of about 40,000 seedlings was also planted in Spring 1941. These transplanting operations would have been attended to in Monsoon 1941 but on account of the unexpected disruption of the lease of the site, these could not be proceeded with, and for the same reason seed of only 10,000 khati fruit, which could be made available easily, was sown. Negotiations to acquire a pacca site from the Irrigation Authorities at Lyallpur are afoot.

For the purpose of selecting citrus trees of merit the nursery staff visited important gardens near Bhera, Bhalwal, Sargodha in December, 1941 and marked 226 trees of merits.

The Nursery Supervisor kept a record of the mango trees of merit marked in various parts of the Punjab, and also paid a visit to U. P. in order to mark trees of merit in important mango producing areas of that province; and was able to select 36 new parent trees at Saharanpur, Mallhabad, Lucknow and Benares. The scheme for supplying grafts from U. P. could not be put into practice for want of funds.

The audited trading account of the Nursery Scheme for the year ending 30-9-41 is given at the title cover which shows a surplus of Rs. 2,583/- after inclu-

sion of the first valuation of plants amounting to Rs. 2,327/13/- in the year under reference. After meeting the previous preliminary losses, only a sum of Rs. 793/- needs recoupment at present.

IRRIGATION AND REVENUE STANDING COMMITTEE

Thanks to the efforts of the Executive Committee of the Fruit Development Board, double wari was sanctioned by the Irrigation Authorities last year. According to the figures available from the office of the Fruit Specialist, Punjab, Lyallpur, 1056 applicants have so far come forward to take advantage of the concession of double wari for gardens, and out of these 514 have already been recommended to the Irrigation Department. The working of this concession has revealed some serious defects which, along with other grievances of the Board, have been brought to the notice of the Irrigation Authorities. In this connection the Deputation of the Board is also going to wait shortly on the Hon'ble Minister for Revenue. The Board is particularly grateful to its worthy President; Mr. H. R. Stewart, Director of Agriculture, Punjab; R. B. Bawa Natha Singh, Retd. Chief Engineer, Irrigation Works; S. Satwant Singh; Maulvi Abdul Bari and S. B. Dilbagh Singh for the keen interest they have been evincing in this matter.

Fruit Marketing Standing Committee.—

The need for the provision of proper marketing facilities for the Punjab Fruits, in and outside the province, is really great. During the year under review, the Executive of the Board tried to expediate the construction plans of the Lahore Municipal Wholesale Fruit Market and as many as three meetings were held with Municipal Engineer, Lahore to discuss and approve the plan of the proposed Fruit Market. From letter No. 5196-G dated 21-10-1941, received from the Administrator of the Lahore Municipality, it appears that the construction of this market is now receiving due consideration. We wish this facility to be provided as early as possible so that we may be able to give

start to our marketing programme. We are grateful to the Administrator for taking special interest in the matter and we promise him our whole-hearted co-operation.

REGISTRATION OF NURSERIES, SEED-STORES AND GARDENING FIRMS

The Board introduced last year a system of registration nurseries, seedhouses and gardening firms all over India. During the year, registration certificates have been issued to 22.

Similarly, we intend to take measures to register bona fide fruit commission agents from all over India, on the recommendation of the Marketing Officers of various provinces.

ASSEMBLY MEMBERS FRUIT GROUP

The members of the Assembly Fruit Group continue to take active interest in promoting the cause of Fruit Industry in the Punjab.

We hope that when the proposed Fruit Cess Bill is introduced in the Punjab Legislative Assembly, they would strongly support it.

Here I wish to record the sad demise of the Hon'ble Sir Sundar Singh Majithia, the late Revenue Minister, Punjab who was a distinguished sympathiser of ours as well as that of Nawab Sir Hayat Khan Noon, a very distinguished member of the Board and of the Assembly Fruit Group.

The Fruit Cess Bill.—We have been anxiously awaiting the passing of this Bill which will certainly serve as a key-stone of the structure of this Board; and it is gratifying to mention that this bill is now engaging the attention of the authorities.

ACCOUNTS

The accounts of the Board for the year ending 30th September, 1941, were audited by Ch. Nawab Din, Inspector, Co-operative Societies, Chak Jhumra, on 22-10-41 and are pending approval of the Accounts Subcommittee presided over by Mr. J. G. Bhandari, Financial Advisor, Co-operative Department. For balance sheet and profit and loss accounts, reference may be made to the title cover.

Local Bodies Contributions.—We received a subsidy of Rs. 2,500/- from the Punjab Government and the following contributions were made by the various local bodies for which we are grateful to them:

	Rs.
District Board, Lahore.	.. 100
District Board, Amritsar.	.. 200
District Board, Montgomery.	.. 100
District Board, Gurdaspur.	.. 50
District Board, Jhelum.	.. 50
District Board, Ferozepore.	.. 50
Municipal Committee, Amritsar.	.. 50
Total :	.. 600

FINANCES

The budget figures for the year ending 31st March, 1941 indicate that, in spite of the curtailment of a number of necessary items of expenditure, the year is likely to close with a deficit of Rs. 1,315/- which, in the revised forecast basis, is likely to go up to Rs. 2,000/- on account of the supplementary expenditure for the Fruit Preservation Number" of the Punjab Fruit Journal.

We, however, hope to balance the budget when the Government grant is increased from Rs. 2,500/- to Rs. 5,000 next year which was kindly promised last year both by Sir Manohar Lal, the Hon'ble Minister for Finance, Punjab and Hon'ble Ch. Sir Chhotu Ram, Minister for Development, Punjab.

NEW PROGRAMME OF WORK

Apart from the work already in hand i.e. publication of the Punjab Fruit Journal and other horticulture literature, irrigation facilities, removal of grievances of fruit growers, extension of Nursery and Bud Selection Scheme, marketing programme, there are other matters also which we expect to take in hand next year when financial resources permit, and of these the following may be mentioned.

1. Encouraging model gardens in the districts.
2. Development of the bye-products industry—particularly juice industry in order to make best use of the surplus or unsaleable fruit for some bye-products on co-operative basis

as is done by Citrus Bye-Products Factory of California Citrus Growers Exchange.

3. Creation of a reference library on horticultural literature.
4. Conducting horticultural tours of some important fruit producing centres of the province at least twice a year for the benefit of those interested in fruit gardening.
5. Establishing business relations in India as well as abroad.
6. Organisation of a Supply Depot for gardening requirements and canning materials.

APPRECIATION

Before concluding I must record my deep sense of gratitude to the members of the Managing Committee and the Standing Committees and the Hon'y. Office-bearers who have been evincing keen interest in furthering this noble cause at considerable personal inconvenience. Out of these I am particularly thankful to S. B. Ujjal Singh, Mr. J. G. Bhandari; Lala Mehr Chand Mahajan; Mitchel Brothers; K. S. Ch. Mushtaq Ahmed; K. S. Niaz Ali Khan; R. B. Parkash Chand Mehra; Mian Abdul Aziz M.L.A., R. B. Janki Das; S. Satwant Singh; Dr. Abdul Waheed Khan; R. B. Dr. Maharaj Krishan Kapoor for the valuable co-operation during the year.

The Board is also grateful to H. R. Stewart, Esq., Director of Agriculture, Punjab, Sardar Sahib Kartar Singh, Marketing Officer, S. Pritam Singh, Assistant Marketing Officer; Ch. Nawab Ali, Assistant Registrar, Co-operative Societies, Lahore circle; Kh. H. G. Sadiq, S. Darshan Singh Vahali, Mian Mukhtar Nabi, Deputy Directors of Agriculture; Dr. Khan A. Rahman, Government Entomologist, Lyallpur; K. B. Niaz Mohammad, Executive Engineer, Irrigation, Lyallpur, who have been helpful to me in several ways. Before I conclude, I wish to record my sincerest gratitude to the Hon'ble Ch. Sir Shahab-ud-Din, the President of the Board, for his valuable guidance in all matters and without whose help very little could have been achieved.

HONORARY SECRETARY.

FRUIT JOURNAL TRADING ACCOUNT FOR THE PERIOD 1-10-40 TO 30-9-41.

Account Head	Dr. Rs.	Cr. Rs.
1. To stock as on 30-9-40	...	801-14-0
2. By stock as on 30-9-41	...	2,222-2-0
3. Subscriptions	...	661-1-8
4. Advertisement Revenue	...	
5. Postage	610-4-3	
6. Printing	1,026-13-9	
7. Establishment	1,107-6-0	
8. Miscellaneous	112-5-6	
Total	3,621-1-6	3,685-1-8
Profits of the period (taken over to P. & L a/c)	64-0-2	
Grand Total	3,685-1-8	3,685-1-8

Note.—(i) The following items are recoverable in the above account :—

1. Subscription bills outstanding ... 42-12-0
2. Advertisement bills outstanding... 238-8-0

Total ... 281-4-0

(ii) The above account also includes a payable bill for Rs. 45/6/-.
(Sd.) K. L. KOHLI, (Sd.) M. NAWAB-UD-DIN,
Assistant Secretary, Punjab P.C. Inspector, Co-operative Societies,
Fruit Development Board, Lyallpur. Chak Jhumra (Auditor.)

NURSERY TRADING ACCOUNT FOR THE PERIOD 1-10-40 TO 30-9-41.

Account Head	Dr. Rs.	Cr. Rs.
1. Valuation of plants as on 30-9-41...	...	2,327-13-0
2. Sales of Citrus Plants	...	3,796-15-6
3. Sales of Mango Grafts	...	845-5-0
4. Establishment a/c	2,147-8-6	
5. Postage a/c	255-8-0	
6. T. A. a/c	658-1-6	
7. Seed & Manure a/c	519-5-3	
8. Labour a/c	401-13-9	
9. Rent a/c	204-13-9	
10. Miscellaneous a/c	148-15-0	
11. Plants Packing	39-12-6	
12. Depreciation a/c	13-15-6	
Total	4,389-13-9	6,970-1-5
Profits taken over to P. & L. a/c	2,580-3-9	
Grand Total	6,970-1-6	6,970-1-6

Note.—Rs. 303/14/3 on account of bills are recoverable in the above accounts.

(Sd.) K. L. KOHLI, (Sd.) M. NAWAB-UD-DIN,
Assistant Secretary, Punjab P.C. Inspector, Co-operative Societies,
Fruit Development Board, Lyallpur. Chak Jhumra (Auditor.)

 PROFIT & LOSS A/C FOR THE PERIOD 1-10-40 TO 30-9-41.

Profits.

1. Interest on Bank Deposits	...	...	Rs. 74-13-3
2. Associate Subscriptions	...	...	35-0-0
3. Contributions	...	...	780-0-0
4. Govt. Grant	...	...	2,500-0-0
5. Nursery Registration Scheme	...	...	134-15-0
6. Profits of Nursery Trading A/c	...	...	2,580-3-9
7. Profits of Fruit Journal Trading A/c	...	...	64-0-2
8. Profits of Bulletins Trading A/c	...	...	15-12-9
			<hr/>
Total	...	...	6,184-12-11

Losses.

1. Establishment (General)	...	...	Rs. 1,120-13-9
2. Postage (General)	...	...	264-0-3
3. Printing (General)	...	...	280-2-0
4. Stationery	...	...	308-14-0
5. Depreciation	...	...	64-11-3
6. T. A. a/c	...	...	91-14-6
7. D.A. of Assistant Secretary	...	...	23-0-0
8. Telephone a/c	...	...	198-2-0
9. Miscellaneous a/c	...	...	71-12-6
			<hr/>
Total	...	...	2,423-3
Profits of the period taken over to Balance Sheet	...	...	3,761-6-8
			<hr/>
Grand Total	...	...	6,184-12-11

(Sd.) K. L. KOHLI,
 Assistant Secretary,
 Punjab P. C. Fruit Development
 Board, Ltd., Lyallpur.

(Sd.) M. NAWAB-UD-DIN,
 Inspector,
 Co-operative Societies,
 Chak Jhumra (Auditor)

**BALANCE SHEET OF THE PUNJAB PROVINCIAL CO-OPERATIVE
FRUIT DEVELOPMENT BOARD, LTD., AS ON 30TH SEPTEMBER, 1941.**

Liabilities.

1. Punjab Fruit Journal Fund ...	...	...	Rs. 1,378-2-1½
2. Membership Subscriptions ...	...	...	4,428-5-9
3. Reserve Fund ...	...	...	466-0-8½
4. Bulletin Honoraria ...	...	...	15-12-6
5. Individual Deposits ...	...	...	8-6-0
6. Staff Securities ...	...	...	380-15-0
7. Suspense ...	...	...	565-7-0
8. Fruit Journal payable Bills ...	...	...	45-6-0
			<hr/>
	Total	...	7,288-7-1
Profits as per P & L. A/c for the year ending 30th September, 1941	...	...	3,761-6-8
			<hr/>
Grand Total	...	...	11,049-13-9

Assets.

1. Savings Deposits with the Punjab Provincial Co-operative Bank, Ltd., Lahore ...	...	...	Rs. 5,415-1-11
2. Current Deposits with the Central Co-operative Bank Ltd., Lyallpur ...	...	...	148-14-0
3. General Petty Cash in Hand ...	...	...	50-0-0
4. Nursery Petty Cash in Hand ...	...	...	15-14-3
5. Imprest with the Hony. Secretary ...	...	...	179-7-6
6. Postage in Hand ...	...	...	50-10-6
7. Staff Securities (individual a/cs) ...	...	...	380-15-0
8. Valuation of Nursery Plants Stock ...	...	...	2,327-13-0
9. Valuation of Publications Stock ...	...	...	1,175-4-0
10. Nursery Stock (Implements) ...	...	...	125-11-7
11. General Stock (Furniture) ...	...	...	582-5-9
12. General Bills Recoverable ...	...	...	7-6-0
13. Bulletings Bills recoverable ...	...	...	5-4-0
14. Nursery Bills Recoverable ...	...	...	303-14-3
15. Fruit Journal Bills Recoverable ...	...	...	281-4-0
			<hr/>
Grand Total	...	...	11,049-13-9

I have audited the Balance Sheet of the Punjab Provincial Co-operative Fruit Development Board, Ltd., as on 30-9-41. In my opinion such a Balance Sheet subject to my remarks given in the audit report, exhibits the true and correct views of the Board's affairs to the best of my information and the explanations given to me and as shown by the books of the Board,

(Sd.) K. L. KOHLI,

Asstt. Secretary,
Punjab P. C. Fruit Development.
Board, Ltd., Lyallpur.

(Sd.) NAWAB-UD-DIN,

Inspector,
Co-operative Societies,
Chak Jhumra (Auditor).

A Directory of Approved Nurseries, Seed Houses and Gardening Firms

With a view to place before the fruit growing public of various provinces a list of reliable Nurseries, Seed Houses and Gardening Firms, the Punjab Fruit Development Board introduced the registration scheme recently, details of which have already been published in the October 1940 issue of this journal. The criterion of reliability, fixed by the Board, is that the firm concerned must be able to procure a favourable report from the Agricultural Department of the Province to which it belongs.

Under this Scheme the following firms have so far been registered and they guarantee to supply reliable healthy plants, seeds, etc., viz., true to parentage and free from insect and fungus pests.

★ PUNJAB. Nurseries.

1. Messrs. Brij Lal Orchads, Pathankote.
2. The Manager, Jamalpur Fruit Farm, via Sarna Railway Station, near Pathankote.
3. Messrs. Popular Nurseries and Fruit Farm, Gujranwala.
4. Messrs. Indian Mildura Fruit Farms, Ltd., Renala Khurd, District Montgomery.
5. Bakhshi Kanhya Lal, Advocate, Gujranwala.
6. The Manager, Feroz Gardens and Nurseries, village Mahmud Buti, near Hydro-Electric Power Station, Shalimar, Lahore.
7. S. Kartar Singh Dewana, Dewana Fruit Farm, Chak No. 370, Sardarwala, P. O. Parkarabad, District Sheikhpura.
8. Messrs. B. B. Bannerji and Sons, Nurserymen, Saraswati Gardens, Simla E.
9. Bakhshi Garden, Nurpur (Railway Station) Nurpur Road, District Kangra.
10. Khalsa College Nursery, Amritsar.
11. The Nazir Nurseries and Fruit Farm, Gujranwala.
12. Ch. Siraj Din, Plant Seller, Lawrence Road, Lahore.
13. Kot Ganesh Das Farm. Mian Channu, District Multan.
14. Parkash Nursery, Muzaffargarh, Punjab.
15. Sardar Garden Nursery, Village and Post Office Chak No. 171-A.L., Sardarpur (Tehsil Okara, Distt. Montgomery).
16. Mushtaq Gardens and Nurseries, Mian Channu.

★ UNITED PROVINCES. Nurseries.

1. Messrs. L. R. Brothers, Saharanpur.
2. Henbane Nursery, Saharanpur.

★ BIHAR. Nurseries.

1. Messrs. Paghunandan Sah and Sons, Govindpuri, Muzaffarpur.

★ BOMBAY. Seed Houses.

1. Messrs. Pestonji P. Pocha and Sons, 8, Napier Road, Poona.
2. Messrs. N. Cooper and Co., 21, Wellesley Road, Poona, 1.

Nurseries.

3. Messrs. Garden Supplies Co., Ville Parle, Bombay.

★ MADRAS. Nurseries.

1. Messrs. E. R. Sampanji and Sons, Lalbagh, Fort Road, Bangalore City.
2. S. K. I. Kadir Mesra Sahib, Head Nursery, Salem (S. I.).

Gardening Firm.

1. Messrs. Standard Furniture Co., Kalai, Malabar (India).

While replying please mention the Punjab Fruit Journal.

Stirring Appeal to the Fruit Growing Community TO HELP THE WAR EFFORT

— BEING —

The Annual Address

by

*The Hon'ble Mian Abdul Hayes, Minister for
Education, Punjab, delivered at the Seventh Annual
General Meeting of the Punjab P. C. Fruit
Development Board, held at the
U. M. C. A. Hall, Lahore,
on January 7, 1942.*

The Hon'ble Ch. Sir Shahab-ud-Din and Gentlemen,

I am indebted to my friend Hon'ble Ch. Sir Shahab-ud-Din, the President of the Punjab Fruit Development Board, for his very kind invitation to me to preside over this, the Seventh Annual General Meeting of the Board. I deem it indeed a great privilege to have been admitted to the counsels and deliberations of this important co-operative organization, rightly designated as the "Parliament of the fruit growers in this province", its annual stock-taking of what it has realised and what still remains to be accomplished. It has been gratifying to listen to the President's elaborate review of the varied activities of the Board, its great achievements and contributions in developing and popularising horticulture in this province. The Board and those who are responsible for planning its programme and policy can justly be proud of what it has done

by way of publicity and propaganda, by way of dissemination of best horticultural knowledge, and the propagation of the best variety in fruit trees and culture in the province. Equally praise-worthy are its earnest endeavours to develop and foster a new type of co-operative enterprise, so vitally beneficial for the economic emancipation of our rural population. It can be proud of its untiring efforts for securing for its members better marketing opportunities and irrigation facilities and for zealously championing and protecting the interests of persons engaged in horticulture. The industry has indeed made a remarkable head-way under its fostering care and guidance during the last seven years. It has immense possibilities of expansion and development in the future with the Board endeavouring to secure those conditions which are essential for its

healthy growth and progress. I agree with you that the inclusion of training and instruction in fruit preservation in the curriculum of girls schools will be a very profitable proposition and would go a long way to encourage fruit cultivation. There are however other aspects of the question as well and they need a closer examination before formally adopting the suggestion. I shall also consider favourably the suggestion that Government and state-aided schools should be asked to subscribe to the Periodical published by the Board. This would, in my opinion, not only bring more revenues to the Board and thus strengthen its financial position but will also ensure the supply to students of useful literature containing the results of modern researches in horticultural practice and experimentation both in India and in those countries where fruit growing and fruit preservation occupy a dominant position in national economy. I trust my Hon'ble colleague in charge of Finance, whom I will pass on your request for financial assistance, will consider it in a spirit of sympathetic accommodation and will see his way to help you by finding you suitable sum in the budget despite the paramount claims of the War.

The President has emphasised the boundless scope of development and growth of the national fruit industry in the Punjab in view of certain natural advantages—a variety of climate, rich soil, the net work of canals and cheap labour in rural areas. The chief natural advantage, to my mind, for popularising this industry is the fact that horticulture is so closely allied to the principal occupation of the people—agriculture, which affords living to more than 85% of the people in this province. The Punjab is essentially an agricultural province, it is the land of peasant proprietor, where cultural land is in plenty, irrigation facilities almost unparallel and the peasantry, which still provide the motive power for every agricultural operation in India, safely the hardest in the world. There are portents which augur well for the future of the fruit industry in this pro-

vince. Granted a few concessions and facilities by the Government such as better marketing and transport facilities for fruits and fruit products, favourable and reduced revenue and abiana charges, liberal freight and tariff concessions, application of Kharaba rules to orchards and better supply of canal water and lastly the grant of subsidies to a selected number of fruit growers, I am confident the industry will be put on sound and sure footing and, as time passes on, will come to occupy an important place in our village economy to which it is entitled by virtue of the immense natural advantages it possesses and the great potentialities it has for development. The time is not far when peasants will realise that fruit cultivation, even on a small scale, as against growing of staple crops, has in itself the unfailing key to their economic prosperity. With the spread of horticultural knowledge and literature they will know how other countries have developed their resources in this direction, and how in California, Palestine and Egypt, fruit growing has led to tremendous national affluence and prosperity.

The War has offered us a unique opportunity for inaugurating fruit preservation industry on a larger scale and with the stoppage of foreign imports in preserved fruits, a market is assured for our indigenous produce. There are great business possibilities and a huge demand for Jams, Jellies, Juices and squashes manufactured in the Punjab. I hope some enterprising people will band themselves together into a co-operative organization to exploit the possibilities of the situation. They can obtain all the requisite guidance and assistance from the Agriculture Department and I hope the Punjab Fruit Development Board too will be coming forward for such help in the venture as it can readily offer. If such a proposition could materialize—as undoubtedly it would—cases of fruit grown and tinned in the Land of Five Rivers would be a welcome gift for the Punjab soldiers fighting and undergoing cheerfully untold rigours of war so that we should live in peace and safety. At this critical hour in world history when the fruit growers have assembled together

here to discuss ways and means for putting fruit industry on the map of the world, let this be their ideal, let this high purpose inspire them to embark on their project, let all of us, growers, traders; workmen; subordinate our objectives and aspirations to the common goal. Business, commerce, civilization and culture are the hand-maids of peace, they are the products of peaceful times, now when the peace itself is on tenter-hooks, let them join hands, let them march together in unshakable partnership, in pursuance of the common purpose—peace with honour and victory. I hope the fruit growers, when they sit to enjoy the fruits of their labour and efforts, will not forget the defenders of liberty, freedom and justice fighting in different lands. I hope they will not hesitate to offer their best, for strengthening the war effort and for bringing comfort and happiness to their brethren resisting gallantly the advancing forces of aggression.

I find that your Board comprises not only members of all communities but leading men of all professions—the Hon'ble Speaker of the Punjab Assembly, several M. L. A.'s, a High Court Judge, eminent lawyers, business magnates, doctors, engineers, professors, civil servants, big landlords as well as petty fruit farmers. All this not only gives your Board a most representative character but it also incidentally shows to what extent the fruit industry has caught the imagination of people of all classes. Nor is their interest of only an academic nature, for they are all taking fruit farming as a real business proposition to the advantage of our Province. To show how the industry benefits even the poor classes of people, I may venture to cite just one instance. Before my former colleague Lala Mehar Chand Mahajan, who is also a big fruit grower, established his squash factory at Pathankot about three years back, the poor zamindars there used to fetch hardly a rupee per maund for their 'galgal' which

now sells easily at four times its original price.

A visit to the Fruit Show in the University Hall this morning gladdened my heart immensely, for it showed the rapid strides the Punjab Fruit industry has made since the appointment of Sardar Lal Singh, Fruit Specialist, in 1926. Not only fruit farming has become a national asset but a new industry—fruit preservation—juices, squashes, etc., has also come into existence. And I am proud of the fact that the founder or the father of the Punjab Fruit industry hails from my own home district. Lest I may be accused of partiality, I endorse what my worthy colleague, Chaudhri Sir Chhotu Ram remarked last year in his speech that "Fruit culture and fruit preservation owe an immense debt of gratitude to Sardar Lal Singh. We are all proud of him and of his services to the fruit industry. He is a mighty worker, a forceful personality, an indefatigable propagandist and thus combines in himself qualities which are essential for the success of any new venture." I congratulate him most heartily for the recognition of his services by Government by the award of the title of Sardar Bahadur.

I again thank my esteemed friend, the Hon'ble President for his kindness in extending an invitation to me to preside over this function. I look upon the Board and its various activities, guided by its President, with deep admiration. The Board has indeed done a great service by focusing public attention on the great latent possibilities of this infant industry and by showing the way to ensure both qualitative and quantitative expansion of fruit farming in this province. I hope the Fruit Development Board will continue to flourish and be of still greater help to the poor zamindars of the Province.

"Horticultural Abstracts"

By

M. Musahib-ud-Din,

Fruit Section, Lyallpur.

I. Fresh Fruit Consumption in U. S. A. per capita in lbs.

Year.	Total Citrus.	Apples.	Total ex- cluding Citrus.	G. Total
1920-21 to 1924-25	27.2	50.9	107.2	134.4
1925-26 to 1929-30	29.8	42.6	108.8	138.6
1930-31 to 1934-35	37.0	38.9	95.3	132.3
1935-36 to 1939-40	44.2	41.0	106.8	151.0

—California Citrograph, October 1941.

The above data show the growing popularity of citrus fruits over apples in the United States.

II. Canning Navel Orange juice by Ralph H. Highy.

Navel oranges have never been extensively used for the manufacture of canned juice because of the bitter taste, which develops in the juice from this variety when allowed to stand exposed to air, or when it is pasteurized. Bitterness is due to 'Limonin' (not to be confused with limonene of orange oil) and 'Isolimonin.' They are not related to 'Naringin,' the bitter principle of grapefruit. Limonin is present in a greater quantity in unripe fruits than in ripe ones. In fruits it is found not in the juice itself but in the albedo, the central bundles and in the veins of the fibro-vascular bundles. It is present in water soluble and non bitter form, probably as one part of an easily hydrolized saccharide complex. In contact with the acid juice, this complex is split and the bitter principle released. Inclusion of air

during juice making hastens hydrolysis. Selection of ripe fruits, prevention of bitter substance being extracted during the extraction of juice and the prevention of hydrolysis of bitter forming substance would result in a juice which would not go bitter even if stored for a longer period.

III. Citrus Production in the United States in 1940-41.

It exceeded that of any previous year, aggregating 142,000,000 packed boxes (equivalent to about 340,000 carloads of 18 tons each or 6,000,000 tons). Of this, California and Arizona accounted for about 50%. The increased production of lemons was the most outstanding yielding 17,000,000 packed boxes (42,049 Carloads) and exceeding the largest previous harvest by 43%. The orange production amounted to 82,000,000 packed boxes and that of grape fruit to 43,000,000.

Substantially all this huge production was marketed either as fresh fruit or canned or as a variety of useful and healthful products.—California Citrograph, December, 1941.

IV. Changes in Carotene and Ascorbic acid content of Mangoes during Ripening.

The Vitamin content of mangoes from the same tree shows considerable variation, that of the skin always exceeding that of the pulp. During ripening at room temperature (33-44°C) in the pulp diminishes from the green to the half ripe stage and rises to a steady value during storage at room temperature or 0° C. Half ripe mangoes kept at 0° C for 17 days do not ripen when brought to room temperature. The

carotene content increases throughout ripening.—Tropical Agriculture, December 1941.

V. The present status of rough lemon rootstock.

According to Camp, A. F., rough lemon rootstock which made possible the large scale citrus industry on the sandy soils of Florida, has been alternately praised and condemned for many years. Trees on this stock are usually more vigorous in growth but frequently tend to an alternate bearing condition with coarser fruit of poorer flavour and colour and slower in reaching maturity than were those on sour orange stock. It has now been shown that excellent fruit can be produced on trees on rough lemon stock even on light sandy soils by the proper use of magnesium, manganese, copper and zinc in addition to the

ordinary fertiliser constituents. Other things being equal sour orange stock will produce somewhat better fruit, but with proper nutritional practices rough lemon stock will give fruit that will be acceptable to all markets. This fact combined with its very high production and ease of handling gives it a distinct advantage over any other stock tried so far on sandy soil.—Biological Abstracts, December 1941.

Note.—Rough lemon is the most common root stock used in the Punjab.

VI. Retention of vitamins C and A in glass packed foods.

[by C. R. Fellers and R. E. Buck. (Mass. Expt. Sta.)]

Large experimental cannery packs of tomato juice, pureed peas (three varieties) and spinach were packed mainly in flint

Do you know? That bees can increase the yield of your fruit trees?
And that they can better the *quality* of your fruits?

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While replying please mention the Punjab Fruit Journal.

jars, although some tomato juice was also packed in amber glass. These products sealed and processed by commercial procedures and stored (i) at 35°—40° F. in the dark, (ii) at 70°—80° F in the dark and (iii) in the light, and (iv) at 92° in the dark, were analyzed for their content of vitamins A and C immediately after canning and at stated intervals up to 400 days. Strained carrots were also included in the study of vitamin A losses. The degree of retention of vitamin C was similar in the several products, the loss amounting to only 10—25% after storage for one year at room temperature (70°—80°F). Most of this loss occurred within the first two or three months of storage. At a storage temperature of 36°F less than 5% of the

vitamin C was lost within the year, while at 90°F the average loss approximated 21%.

Storage in the light hastened the reduction in the Vitamin C content of glass packed foods but the total loss remained the same. About 85% of the total vitamin A (Carotene) of the glass packed strained spinach, carrots, pears and tomato juice was retained after storage in subdued light for one year. The amber glass had some protective value in retaining the vitamin A content of tomato juice. Products stored at 36°F were superior in colour and flavour to those held at 70°F or 90°F. The bottled tomato juice was still of good flavour and colour after more than a years' storage close to west windows.—Experiment Station Record, December 1941.

ALL ABOUT KASHMIR FRUIT INDUSTRY

Readers of the Punjab Fruit Journal are informed that only a few copies of the illuminating and comprehensive Bulletin dealing with the Fruit Industry of Kashmir, published by the Punjab Fruit Development Board, are left in stock. This Bulletin is based on the observations made by the Fruit Specialist, Punjab, and the Assistant Fruit Specialist during their visit to Kashmir State.

Price, Annas -/3/- Postage Free.

**THE PUNJAB FRUIT DEVELOPMENT BOARD,
LYALLPUR.**

Speech

Delivered by

H. R. Stewart Esq., C.I.E., I.A.S.

Director of Agriculture Punjab on the occasion of Prize Giving of the Annual Provincial Citrus Fruit Show, Lahore on 10th January, 1942.

It was not till 1926, some twenty years after the Punjab Agricultural Department first came into being, that the appointment of a Fruit Specialist made it possible to give serious attention to the encouragement of fruit growing in this province. Two years later the first Provincial Fruit Show was held in Lahore as one of the measures designed to popularise the nature and quality of Punjab citrus fruits, as well as to afford those interested in fruit growing an opportunity of meeting together and discussing their problems.

The present Show is the thirteenth which has been held. In size it is smaller than its immediate predecessors, for there has been a considerable decrease in the number of fresh fruit exhibits this year. This reduction is not due to any lack of interest or enthusiasm on the part of fruit growers but to the peculiar circumstances of the present year. Very severe heat last May and June caused an abnormal proportion of fruit to shed from the trees, so much so that this year the citrus crop of even the most fortunate growers is at best not more than 75 per cent of the normal, whilst in the majority of cases it is very far below that proportion. Good prices and keen demand have also contributed to earlier disposal of the crop this year than usual.

A year ago for the first time, it was possible to get a correct idea of the area under fruit in the Punjab, for previously revenue records had not distinguished between fruit

and vegetables. According to the data now available 93,000 acres were under fruit orchards in the province in 1939-40. The decision made last year to grant a double supply of irrigation water in canal colonies for fruit growing up to a total of $\frac{1}{2}\%$ of the culturable commanded area on each canal has given an impetus to fruit production and, when utilized to the full extent admissible, an additional area of upwards of one lakh acres can be planted under fruit. During the past year applications for an enhanced water supply under this scheme have been forwarded to the appropriate authority through the department for about 6,000 acres of new fruit orchards, whilst many more are under examination.

On the fruit products side, the exhibits this year are much more numerous, cover a much wider range and have been presented more attractively than previously. This is gratifying, for it is a measure of the effort which the Punjab is making to meet its share of the heavy demand from both civilian and military sources in India for products which it has become difficult, if not impossible, to import into this country under war conditions. The products of some exhibitors at this Show are already well-known throughout the length and breadth of India and even outside it. Some exhibitors are already fulfilling large contracts for the Supply Department and others have just recently secured contracts of a similar nature for one or more of their products.

The part which these commercial firms are playing in the war effort is particularly welcome to the Punjab Agricultural Department, which has been the pioneer in India in popularising fruit preservation as an indispensable adjunct of profitable commercial fruit growing, in interesting businessmen sufficiently in its possibilities to risk investing their capital, in working out formulae for the preparation of fruit and vegetable products and in training staff to take charge of fruit preservation factories. So great progress has been made in the Punjab in these directions that unofficially the laboratories at Lyallpur are recognised throughout India as the 'fons et origo' from which all knowledge of fruit preservation industry flows. That such recognition of the Punjab in this connection extends even outside the shores of India is demonstrated by the fact that Ceylon sent one of its representatives to undergo the

seven months' course in the commercial manufacture of fruit and vegetable products last year and that negotiations are at present proceeding to send another this year.

In the fruit world the outstanding feature of the past year has been the great fillip which the war has given to the expansion of the fruit and vegetable products industry in this country, because of the large quantities of such products which are required for the fighting services. Neither the Agricultural Deptt. nor the business community of the province has been behind-hand in taking full advantage of this opportunity. Several new concerns have undertaken the commercial manufacture of a variety of fruit and vegetable products, whilst others have confined their activities mainly to the dehydration of potatoes. On its part the Department,

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Price for the Directory is Rs. 5 only plus Re. 1 for postage.

Special Concession—Subscribers of the Punjab Fruit Journal and the Members and Associates of the Board are entitled to get this Directory for Rs. 5 only (*postage free*).

Please fill up the following coupon and post it today.

To

The Hony. Secretary,
Punjab Fruit Development Board,
Lyallpur.

Dear Sir,

I am a *subscriber/member/Associate* of the Board. Please send me a copy of the International Fruit Directory for which I am remitting you by Money Order Rs. 5 *.

per V.P.P. for Rs. 5

*Please strike out those clauses which do not apply.

Yours faithfully,

Name.....

Address.....

liberally financed both by Government and by the Imperial Council of Agricultural Research, is playing a leading part in assisting the Supply Department to obtain products of suitable quality to meet its requirements, by testing and reporting on commercial samples submitted to the Supply Department from all over India as the basis of contracts, indicating faults where they exist and giving detailed advice as to how to avoid them, by carrying out research on the preparation of products new to manufacturers in this country and by training staff to meet the needs both of the inspection side of the Foodstuffs Directorate of the Supply Department and of commercial concerns requiring technical experts to take charge of their manufacturing processes. Ten days ago the first batch of students completed the special course just started in the dehydration of vegetables. The second batch has just begun and it is likely that their training will be expanded

to include both the drying and the canning of fruits.

Fruit and vegetable dehydration is of great importance at present. The limitations on shipping imposed by the war make it well nigh impossible to obtain the complicated and expensive plant required for canning fruits and vegetables. The tin required for making containers is now needed for other important purposes. The pressure of transport, whether by sea or by rail, makes it necessary to reduce the bulk of such foodstuffs to the minimum. In all these connections dehydrated products have everything to commend them. Commercial interests in this province would do well to devote greater attention to this aspect of the industry, for thereby they will not only make a valuable contribution to the war effort but will probably also find the process to be one of considerable financial gain.

BACK NUMBERS OF THE PUNJAB FRUIT JOURNAL

The growing popularity of the Punjab Fruit Journal is well established. Out of 21 issues published so far, including 7 special numbers, as many as, 10 are out of stock and the rest are nearing exhaustion.

Those readers of the Journal who are interested to complete their files, are hereby informed that the following back numbers can be had against charges as below :—

Pre. paid M.O. or V. P.P. Basis.

		Rs.	As.
1	3 issues of the year 1938 priced at Rs. 1/8/- (except January 1938 annual number)	...	1 8
2	Two issues of 1939 (April and October issues)	...	1 0
3	Annual January Number 1940 one issue (cyclopaedic compilation dealing with all aspects of the Punjab Fruit Industry and an indispensable guide and solution of day to day problems for years to come)	...	1 8
4	3 issues of 1941 (except October 1941 issue).	...	2 4
	Plus postage and packing charges	...	1 8
	Total	...	7 12

URDU EDITION BACK NUMBERS

In addition to the above the following Urdu Editions of the Journal are also available :—

		Rs.	As.
1.	January 1940 Annual Number with complete translation of the cyclopaedic English Edition referred to above.	...	1 8
2.	2 issues of 1941 including April 1941 and July 1941 issues	...	0 12
	Postage and packing charges	...	0 9
	Total	...	2 13

While replying please mention the Punjab Fruit Journal.

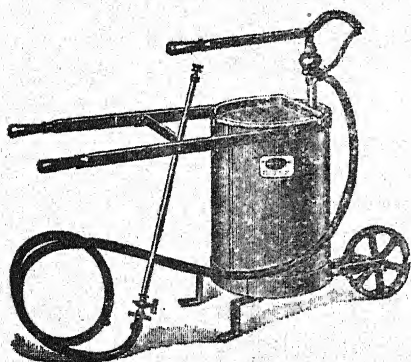
It is the aim of the Agricultural Department that as quickly as possible every thrifty housewife in the Punjab should regard it as a part of her normal annual routine to prepare sufficient fruit products for her family's needs during the year. An intensive effort in this direction is being made and during the last year 28 short courses in fruit and vegetable preservation for the home were held at 22 centres in the province. 770 students attended these courses. Of them 345 were ladies, but it is a disappointing feature of the present Show that only four ladies have sent exhibits of home prepared products.

This Show continues to receive unstinted support from several outside sources. As many as 16 District Boards have made available additional prizes to the total value of Rs. 715 for competition amongst exhibitors from within their respective boundaries. The North Western Railway Administration and the Lahore Municipality as usual have

granted much appreciated concessions in regard to the transport and admission of the exhibits. The University has again made its hall available as the venue for the Show. Lastly, a considerable number of gentlemen have given their time and talent to judge the many exhibits. To all who have contributed to the success of the Show in these various ways the Agricultural Department is exceedingly grateful.

A departure has been made this year in the form of the prizes. In recent years it has been the practice to award silver cups for the general display of exhibits and silver medals for all other prizes. This year all prizes, other than the challenge cups, take the form of Defence Savings Certificates or Stamps, according as the value of the prize makes one or other possible. It is hoped that the many prize winners will agree that this is a more appropriate form of award in the light of present day events and conditions.

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1. BRITISH INDIAN STREET

CALCUTTA.

While replying please mention the Punjab Fruit Journal.

Development of Fruit Industry in the Punjab

Being

The Speech Delivered by

The Hon'ble Minister for Development, Punjab, on the occasion of the Annual Provincial Citrus Fruit Show, Lahore on 10th January, 1942.

It gives me very great pleasure to preside over this function to-day. The sight of all this colourful fruit around us, so attractively and artistically arranged for display, is indeed very pleasing to the eye. From the aesthetic point of view a Fruit Show is almost as beautiful to look at as a Flower Show, and, I am sure, that the citizens of Lahore who had the opportunity to come here during the last few days have sufficiently feasted their eyes on this very pleasing spectacle. But fruit is more than flower; it is food as well and of the very best type. The Indians of old who worked wonders in the higher realms of the mind and spirit, lived on fruit alone. It gave them the peace of mind which is so very necessary for high thinking. It is this useful aspect of fruits which concerns us most.

Few people outside a small group of experts and those who are in direct touch with them, realize how the fruit supply of the Punjab is being increased and improved and how a splendid industry is coming into being as a result of the work of the Fruit Section of the Agricultural Department. Only a few years ago, the production of fruit was incidental to the growing of pleasure gardens and the consumption of fruit was considered a luxury of the rich. In the very short period of little over a decade, all this has completely changed. The hobby gardens have become commercial orchards, mere pleasure and play have given way to business and profit, and what used to be haphazard and

traditional has become systematic and scientific. Awakening to the possibilities of fruit industry has resulted in large scale horticultural enterprises and consequently there has been a very rapid increase in the area under gardens. The decision of the Government to grant a double supply of irrigation water for fruit growing in canal colonies, as has just been referred to by the Director, would make it possible for the present garden area of a little under a lakh of acres to more than double itself easily. Judging from the applications pouring in for enhanced water supply I can confidently look forward to much greater increase in the area under fruit cultivation. Mere extension of area would not have been enough if the fruit grower had stuck to old grooves and the glaring defects found in old methods of fruit growing had continued to exist. Happily the Agricultural Department has achieved striking success in its intensive propaganda and advisory work, through leaflets, lectures, demonstrations and provincial and district fruit shows, and now fruit growers are utilizing up-to-date scientific knowledge. Traditional methods of production are not so old and strong in gardening as in field-cultivation and here conservatism has been broken—but not without considerable and careful effort. Fruit growers have been organized into district associations and the inauguration of the Punjab Fruit Development Board promises the carrying out of a big programme of work. The Board has

indeed already achieved prodigious results and these non-official gentlemen, at a considerable cost to themselves of time and money, have by precept and example given great impetus to fruit growing. One cannot sufficiently thank men like Sir Shahab-ud-Din—the grand Old Man of our Province, Mr. Justice Tek Chand, Lala Mehar Chand Mahajan, Sardar Bahadur Ujjal Singh and Mr. Mitchell for all they have done to encourage fruit cultivation and fruit industry. The province owes a deep debt of gratitude to them as well as to others who are showing the way to rapid progress in this direction. The Department has organised nurseries on a large scale for mass production of plants for supply to public at a nominal price. District and provincial fruit shows are held annually and enjoy immense popularity.

Science has not lagged behind organisation; and research and propaganda are constantly helping a new industry to flourish rapidly. Hundreds of new varieties from India and abroad have been tried and many of these are being introduced in various localities. Fruit preservation, almost unknown a few years back, promises to become a flourishing industry. Juice industry is making rapid strides and lacs of bottles are turned every year. Several useful courses of instruction in fruit culture and fruit preservation are being conducted very successfully in Lyallpur and at other centres in the Punjab. These courses enjoy a very good reputation which is now spreading even beyond the limits of India.

It can be confidently asserted that the Fruit industry in the Punjab has been well established and our Fruit Section is easily the best in India. In fact it has already excited the envy of other provinces. I look forward to a time in the near future when fruit cultivation on a very extensive scale would change the face of our fertile province. The application of scientific knowledge to fruit industry has produced very encouraging results, and we are turning out fruit products worth lacs every year. The military demand for these products has given further stimulus to this industry,

and those who have taken to it are adding a good deal to the wealth of the province.

Before turning to the pleasant task of giving away prizes, I would like to congratulate the prize winners and others too for producing exhibits and thus adding to the beauty and attraction of this show. The Director of Agriculture and the men of his department deserve the gratitude of the public for their very keen interest in fruit cultivation and fruit industry. I think I will be guilty of grave omission if I were not to mention at the end that no one has done more for fruit growing in our province than Sardar Bahadur Lal Singh, the indefatigable and resourceful officer who is in charge of this work for the last thirteen years. He continues to display with undiminished vigour the qualities of industry, initiative and originality which have made him so very successful a pioneer in fruit cultivation and fruit industry. I hope he will be able one day to achieve the miracle of turning even the far off barren corners of our province into fruit bearing gardens.

IMPORTANT NOTE

★

The Chief Editor does not hold himself responsible for the views expressed in the articles published by various contributors in this Journal.

Chronicle of the Fruit World (Foreign Section)

By

K. L. Kohli, M.A., L.S.G.D.,

Assistant Secretary,

Pb. P. C. Fruit Development Board,

Lyallpur.

1. Commendable lead of the Australian Government to push canned fruit industry.

The importance of canning industry can be realized from the fact that the Australian Government has prepared a scheme which will cost about £750,000 for canned fruits; by this scheme the Federal Government has decided to accept the financial responsibility for the export surplus of 1941-42. On the assumption that the normal surplus of canned fruits is reduced by diversion to pulp, there will still be an export surplus of 900,000 cases valued at £750,000; the Government has guaranteed this amount.—'Marketing in India,' February 1942, page 57.

2. Empire Fruit can be cheaply stored.

Empire countries with crops of fruit held up by lack of shipping will be interested in the new storage processes of chemists at Bristol University Research Station.

The work was originally designed to meet the problem of Britain's own surplus fruit, but, with the cessation of imports, the results are now available for Empire producers.

Surplus apples are economically stored, with great saving in space, in the form of apple juice and apple treacle. Natural sugar makes this product extremely sweet, and it is a valuable substitute for sugar in all forms of household cooking.

Soft fruit, plums and apples are reduced to dry fine powder, useful for good process-

ing. Plum Powder can be made into jam at any time of the year.

In their work on black currant syrups, the experts have found that after a long period of storage, there was present, in some cases, double the amount of Vitamin C, (a preventive against scurvy) as in fresh citrus juices. The shortage of Vitamin A has also drawn attention to the need for using all surplus carrots, and a powder is now being extracted commercially in a plant normally used for the spray drying of milk.—Illustrated Weekly of India, July 27, 1941.

3. Concentrated Orange Juice in Volume for Great Britain.

Concentrated orange juice, one of the richest natural sources of vitamin C, is to be supplied to Great Britain, under the Lease-Lend act, from California this season. Already the Exchange Orange Products Co. at Ontario, has shipped three solid cars on an order from the federal surplus commodities corporation. Another three cars are being put up as rapidly as suitable oranges are available.

Some idea of the saving in shipping space by sending juice instead of fresh fruit may be visualized when one realizes that to make a single carload—6,000 gallons of the concentrated juice—requires over 30 carloads of oranges. There is as much juice in the six carloads of the canned concentrated juice being made at Ontario as in

two full trainloads of packed fruit each 90 cars long; very nearly as much vitamin C and other valuable orange nutriment as in 75,000 boxes of fresh fruit.—Calif. Citro, August 1941, page 289.

4. Setback to the Palestine Fruit Industry.

Palestine citrus growers have suffered such serious losses as a result of being unable to export fruit, the major outlet for their large volume, that groves have been abandoned on a considerable scale and production this season has been reduced to an estimated 8,000,000 boxes. It was expected, reports the Department of Agriculture, that production this year, based on conditions prior to the War, would be about 19,000,000 boxes.—Calif. Citro, July 1941, page 260.

5. A Latest Model Menu.

At the first national nutrition conference for defence, called by President Roosevelt in Washington in May 1941 the following fruit dietary was given a very prominent place in the daily menu.

In order to achieve our goal (a satisfactory diet for everyone in the United States), it has been figured out that we would have to consume twice as much green

vegetable and fruits as we do now (such things as cabbage, green beans, apples, and so on), 70% more citrus fruits and tomatoes, 25% more eggs, 15% more butter, 20% more milk. All of these are 'protective foods,' rich in minerals or vitamins or both.—Calif. Citro, July 1941.

6. Growing Date Industry in California

"As recently as 1929, dates were regarded as a 'curiosity' crop in the hot, fertile Coachella valley of California, when Bill Cook was six years old, his father C. E. Cook, moved here and set out one of the first commercial date gardens. About this time U. S. Government experiments with imported palms showed that a date variety called Deglect Noor grew most successfully here. By 1936 Coachella Valley date production reached eight million pounds. Date growers harvested eleven million pounds in 1940 their biggest crop. About 95% of all American-grown dates are produced here. Regarding the quality of these dates, the late King Feisal of Iraq wrote:—"We who have been growing dates for centuries have never seen such fine dates in our own country."—Calif. Citro, August 1941, page 299.

WINNER of SEVERAL FIRST PROVINCIAL PRIZES

Genuine Blood Red Malta Plants are available
for sale from the garden of **BAKHSI**
KANHIYA LAL, Advocate, Gujranwala.

NURSERY IS APPROVED BY THE GOVERNMENT.

پنجاب فروٹ نمائش میں کئی ایک اول انعام پانے والے سُرخ مالٹا
کے پودے بخششی کمپنیا لال ایڈووکیٹ میونسپل کمشنر گوجرانوالہ کے باغ سے
خرید کریں۔ مالٹا کا پھل دسمبر و جنوری میں ملاحظہ فرما سکتے ہیں *

While replying please mention the Punjab Fruit Journal.

Commercial Glimpses

By

K. L. Kohli, M.A., L.S.G.D.

1. Five years of progress.

Some five years ago the foundation stone of a fruit juice factory was laid at Pathankot—the centre of the citrus fruit belt of the Kangra valley. It was hardly realized that this modest juice factory started by the enterprising Lahore High Court Bar President, Lala Mehar Chand Mahajan and introduced to the trade as the Glacier Products (India) would rise to be one of the foremost juice factories in India and prove a positive boon to the hundreds of citrus growers of that area who were faced with the acute glut of 'Galgal' and lime fruits.

In this tract almost every important Zamindar owns at least a few plants of

	1937		1938	
	avr. per	max. maund	avr. per	m.x. maund
Galgal	... -/12/-	1/4/-	1/4/-	1/12/-
Limes	... 6/-		7/-	
Sangtra	... -/10/-	per 100	-/14/-	per 100

Messrs. Glacier Products have successfully commercialised methods of manufacturing lemon squash and marmalade from citrus fruits and have also creditably taken up the manufacture of Citric Acid and Sodium Citrate since 1939. An excellent product called mango squash out of country mangoes has been manufactured. Credit for all this must go to the capable young managing proprietor of the firm Mr. Maharaj Krishan Mahajan and his energetic chemist Mr. H. G. Bhatnagar.

2. Congratulations.

We congratulate Rao Sahib Sri V. Krishna Menon, B.A., on whom the title of Rao Bahadur has been conferred. It is through the pioneer efforts of the Rao Bahadur that Messrs. Standard Furniture Company Katal Malabar, a gardening firm

'galgal' and limes which originally fetched him practically nothing but have now become a good source of income since the factory started. Before the construction of this factory 'galgals' were uncommonly cheap and it often did not even pay to bring the fruit to the market.

A good sized lime tree bears more than a maund of fruit in an average year. During 1941 the rate of limes was never less than Rs. 12 per maund and owners of such trees made good money out of the produce.

The following statement culled from the Glacier Products factory records gives an idea of the average market prices of the principle fruits in this area.

	1939		1940		1941	
	avr. per	max. maund	avr. per	max. maund	avr. per	maund
Galgal	2/-	3/8/-	2/8/-	3/8/-	3/-/-	
Limes	8/-	Figures not available	10/-		12/-	Figures not available
Sangtra			1/8/-	per 100		

approved by our Board—have won growing popularity and unstinted admiration for their clean business dealings as manufacturers and suppliers of a varied range of spraying machines.

3. Testimony.

S. B. S. Lal Singh, Fruit Specialist, Punjab, has been pleased to record as under, regarding the recently published international Fruit Directory by Mr. M. S. Chowdhri, which is available from the office of the Punjab Fruit Development Board, Lyallpur, priced at Rs. 5 only (postage free) for subscribers, members and associates.

"I am pleased to glance through the international Fruit Directory compiled by Mr. M. S. Chowdhri of Ludhiana.

This volume is a compendium of useful information for all those fruit growers who wish to get into direct contact with important fruit dealers in India, Great Britain and many other European countries whose complete addresses it gives.

I appreciate the pains Mr. Chowdhri has taken in compiling this book and wish him every success."

4. A Commendable Lead.

In a recent communication Rao Qurban Ali Khan, proprietor, the Henbane Nursery, Saharanpur, informs us that since 1st May 1941, he has been contributing 10% of his net sale proceeds to the War Purposes Fund.

BUCKET SPRAY PUMPS

Useful for washing motor cars, disinfecting houses, white-washing and various other purposes for which spraying is adopted.

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Annals of the Board

By

K. L. Kohli, M.A., L.S.G.D.

Assistant Secretary,

Pb. P. C. Fruit Development Board,
Lyallpur.

During this quarter, the Seventh Annual General Meeting of the Board was held on 7-1-1942 and the Managing Committee and Irrigation Revenue Standing Committee Meetings on 15-2-1942.

The salient proceedings of these meetings are reported as under:—

THE SEVENTH ANNUAL GENERAL MEETING.

Copies of the Presidential Address, Annual Address and Annual Report read in the meeting appear elsewhere in this issue.

The following important decisions were also arrived at:—

(a) The balance sheet as on 30-9-1941 was adopted and the audit note was referred to the Accounts Sub-Committee for close examination.

(b) Decided that a deputation of the Board should wait upon the Hon'ble Minister for Revenue, Punjab, to represent the various grievances of the Fruit Growing Community regarding the working of recent concession, and that a detailed memorandum on the subject should also be sent to the Irrigation Department.

(c) Decided that the Hon'ble Minister for Development, Punjab, be approached for an annual grant of Rs. 5,000 for conducting successfully the Nursery Scheme. (A representation on the subject has been forwarded to the Hon'ble Minister for Development).

(d) Decided that the Administrator, Lahore Municipality, be requested to kindly expedite the construction of the wholesale fruit market at Lahore and allot a decent site free of rent therein to the Board for giving a start to the central Co-operative Fruit Marketing programme. (A representation on the subject has been forwarded to the Administrator, Lahore Municipality).

(e) Also to approach the Hon'ble Minister for Development to provide special grant of Rs. 5,000 per annum for the marketing programme).

OFFICE-BEARERS AND MEMBERS OF THE MANAGING COMMITTEE FOR THE YEAR 1942.

The House approved of the following list:—

1. The Financial Commissioner (Development), Punjab, Lahore.
2. The Director of Agriculture, Punjab, Lahore.
3. The Registrar, Co-operative Societies, Punjab, Rural Reconstruction Branch, Lahore.
4. The Chief Engineer, Irrigation Works, Punjab, Lahore.
5. The Fruit Specialist, Punjab, Lyallpur (S. B. Sairdar Lal Singh),—Honorary Secretary.
6. The Hon'ble Ch. Sir Shahab-ud-Din, 3, Durand Road, Lahore.—President.
7. S. B. S. Ujjal Singh, M.L.A., 94, Wellington, The Mall, Lahore Cantonment.—Vice-President.

Ex-officio Members.

8. Mr. J. G. Bhandari, Financial Advisor to Co-operative Department, Punjab, 6, Canal Bank Road, Lahore.—Vice president.

9. K. S. Ch. Mushtaq Ahmad, P.V.S. (Class I), Punjab Veterinary College, Lahore.

10. Mr. Mitchell, Indian Mildura Fruit Farms, Ltd., Renala Khurd, District Montgomery.

11. R. B. L. Janki Dass, Proprietor, Janki Dass and Sons, G. P. O. Square, Lahore.

12. L. Mehar Chand Mahajan, Advocate, Egerton Road, Lahore.

13. K. S. Ch. Niaz Ali Khan, Jamalpur Fruit Farm, Jamalpur.

14. S. B. Hari Singh, Retired Deputy Commissioner, Criminal Tribes, 69-F, Model Town, Lahore.

15. Mian Abdul Aziz, M.L.A., outside Yaki Gate, Lahore.

16. K. B. M. Fateh-ud-Din, I.A.S., M.B.E., Principal, Punjab Agricultural College, Lyallpur.

17. Dr. Abdul Waheed, Ph.D. Managing Proprietor, Messrs. Ferozsons 365, Circular Road, Lahore.

18. M. Abdul Bari, Fruit Grower, Jaranwala, District Lyallpur.

19. K. B. Mushtaq Ahmad Gurmani, M.L.A., Private Parliamentary Secretary, 22, Fallettis Hotel, Lahore.

20. R. B. Bawa Natha Singh, Retired Chief Engineer, Irrigation Works, Punjab, Lahore, 90, The Mall, Lahore.

21. S. Satwant Singh, Bara Farm, P. O. 186/9-L, District Montgomery.

22. R. B. Dr. Maharaj Krishan Kapur, Temple Road, Lahore.

23. Raja Sir Daya Kishan Kaul, 29, Lawrence Road, Lahore.

24. K. B. Khan Farid Khan Dahi, Hony. Magistrate, Khanewal.

25. Bakhshi Kanhiya Lal, Advocate and Municipal Commissioner, Gujranwala.

26. Risaldar S. B. Sardar Ajit Singh, Sub-Registrar, Jandiala Guru, District Amritsar.

27. S. Kartar Singh Diwana, Chak No. 370, Sardarwala, District Sheikhupura.

28. One representative of the Municipal Committee, Amritsar.

29. & 30. Two representatives of the District Board, Amritsar.

MANAGING COMMITTEE MEETING HELD ON 15-2-1942.

Condolence Resolution

"This Committee sorrowfully records the sad demise of Raja Sir Hari Kishan Kaul, ex-founder and life member of the Punjab P. C. Fruit Development Board and a distinguished patron of the Fruit Industry of the Punjab, and wishes to convey its heart-felt sympathies to the members of the bereaved family."

[While going to press, we regret to announce the untimely and sad demise of Nawab Sir Mohammad Shah Nawaz Khan of Mamdot, M. L. A., an ex-life member and member of the Managing Committee of the Board.—Editor.]

FORMATION OF THE VARIOUS STANDING COMMITTEES FOR THE YEAR 1942

1. Publication Standing Committee.

1. K. B. M. Fateh-ud-Din.

2. R. B. Janki Dass.

3. Dr. Abdul Waheed Khan.

4. S. B. Ujjal Singh.

5. S. Satwant Singh.

2. Nursery Standing Committee.

1. Mr. Mitchell.

2. K. B. M. Fateh-ud-Din.

3. L. Mehar Chan Mahajan.

4. K. S. Ch. Niaz Ali Khan.

5. S. B. Ujjal Singh, M.L.A.

6. S. B. Hari Singh.

7. M. Abdul Bari.

8. K. B. Mushtaq Ahmad Gurmani, M.L.A.

9. K. S. Dr. Mushtaq Ahmed.

10. S. Kartar Singh Dewana.

11. Mr. K. C. Verma, Secretary, Co-operative Society, Model Town, Lahore.

12. Mian Abdul Aziz, M.L.A.

3. Fruit Marketing Standing Committee.

1. S. S. Kartar Singh, Marketing Officer, Punjab.

2. S. Pritam Singh, Assistant Marketing Officer Fruits, Punjab.

3. Representative of the Lahore Municipality.

4. Mian Abdul Aziz, M.L.A.

5. Raja Sir Daya Kishen Kaul.

6. L. Mehar Chand Mahajan.

7. K. S. Ch. Niaz Ali Khan.

8. Mr. J. G. Bhandari.

9. K. S. Dr. Mushtaq Ahmed.

10. R. B. Janki Dass.

11. M. Abdul Bari.

12. R. B. Dr. Maharaj Krishan Kapur.

13. Dr. Abdul Waheed.

4. Irrigation & Revenue Standing Committee.

1. Director of Agriculture, Punjab.

2. Raja Sir Daya Kishen Kaul.

3. S. B. Ujjal Singh.

4. R. B. Bawa Natha Singh.

5. S. Satwant Singh.

6. Risaldar S. B. Ajit Singh.

7. S. B. Hari Singh.

8. M. Abdul Bari.

9. K. B. M. Fateh-ud-Din.

10. Malik Khuda Bakhsh, P.C.S., Revenue Assistant, Lahore.

11. S. Kartar Singh Dewana.

12. K. S. Ch. Niaz Ali Khan.

5. Finance Standing Committee.

1. Mr. J. G. Bhandari (Convener).

2. S. B. Hari Singh.

3. Raja Sir Daya Kishen Kaul.

4. R. B. L. Parkash Chand Mehra.

5. R. B. Janki Dass.

6. R. B. Dr. Maharaj Krishan Kapur.

7. Mian Abdul Aziz, M.L.A.

8. L. Mehar Chand Mahajan.

6. Assembly Members 'Fruit Group.'

1. The Hon'ble Major Malik Khizar Hayat Khan Tiwana, Minister of Public Works, Punjab.

2. S. B. Ujjal Singh, M.L.A.

3. K. B. Mushtaq Ahmed Gurmani, M.L.A.

4. Syed Amjad Ali, M.L.A.

5. Mian Abdul Aziz, M.L.A.

6. L. Duni Chand, Bar-at-Law, Lahore, M.L.A.

7. Sir William Roberts, M.L.A.

8. S. Sampuran Singh, M.L.A.

9. Lt. Naunihal Singh, Mann, M.L.A.

10. Bhai Fateh Jang Singh, M.L.A.

11. Mahant Girdhari Dass, M.L.A.

12. K. B. Haibat Khan, M.L.A.

13. L. Hari Chand, M.L.A.

The following important decisions were also arrived at:—

(a) Besides consolidation and extension of the beneficent schemes already run by the Board the following new items of programme were approved:—

(i) Creation of a reference library on horticultural literature to be located at 3, Durand Road, Lahore.

(ii) Conducting horticultural tours of some important fruit producing centres of the Punjab.

(b) The contents of the endorsement reply of the Fruit Specialist, Punjab, Lyallpur, intimating that H. E. The Governor of the Punjab, was unable to accept at present the proposal of the Board for the levy of a cess on the area under fruit orchards in the Punjab were noted and it was decided to again take up the matter with the Government when the war terminated.

(c) Confirmed that the terms, for distribution on share, of the successful plants on batai basis in vogue may be fixed at 1/3rd and 2/3rd respectively as share of the lessor and the Board respectively.

(d) Decided that in order to encourage the Nurseries approved by the Board no rate of commission should be charged by the Board on the orders for supply of plants re-directed to them.

(e) The supplementary expenditure Budget of Rs. 700/- for the Preservation Number of the Punjab Fruit Journal was confirmed.

(f) The contents of Endt. letter No. S-244 of 31-1-1942 of the Commissioner, Jullundur Division advising measures for destruction of harmful birds for gardens were approved.

(g) Decided that sum of Rs. 36 only, equivalent to his one month's salary need be recovered from Mr. C. L. Bajaj, Ex-Publication Clerk by way of penalty.

Telegrams: 'GLACIER' Pathankot



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[No. 23

"The Food Front"

News from the Centre and the Provinces indicates wide appreciation in lay circles of the greater importance India's food supply position has assumed. Men who direct the grow-more-crops campaign, which must now become an essential feature of India's wartime economy, may look for full provincial co-operation not only in the technicalities of local schemes but also in the various ways by which the enthusiasm of the cultivator can be and must be roused. If the people are fully alive to the threat of food shortages there will be little apathy. They must be told what is wanted and how they can help in the creation of food reserves. Propaganda has fortunately long been recognised as a valuable asset in the application of the results of field and laboratory research to the methods of the humble cultivator and the machinery is presumably there for an intensive propaganda campaign on a nation-wide scale.

Help that can be given by semi-public organisations is considerable. The Punjab Provincial Co-operative Fruit Development Board is, for example, doing excellent work for the promotion of Northern India's expanding fruit growing and promising fruit preservation industries. If stocks of staple foods do fall dangerously low in certain areas, and that has regrettably become a clear probability, fruit

supplies will find a new importance in the daily diet of the people and the innovation would be of lasting value to public health. The Punjab Fruit Industry has been fortunate in the leadership of the California-trained SARDAR LAL SINGH to whose knowledge of scientific fruit culture and his zeal as a propagandist, the Lyallpur laboratories largely owe their growth from a modest research station to a centre of all India importance as well as a training institute attended by students from all parts of the country.

The preservation and canning industries, which may be said to have had their origin in Lyallpur research, have been fulfilling a useful wartime function in developing new varieties of tinned foods for the fighting forces and they may play a still more prominent part in expanding areas under fruit cultivation to help distressed areas maintain balanced, health-giving diets. We do not suggest that tinned pickles and bottled tomato juice could take the place of the all-important atta and rice but where supplies of these commodities cannot meet demand, a steady flow of fresh and preserved fruits would go far to lessen the hardship and the threat of malnutrition.

(Leading article of the "Statesman" Delhi, March 15, 1942.)

The Food Front and the Growers

By

K. L. Kohli, M.A., L.S.G.D.,

Assistant Secretary, Punjab

P. C. Fruit Development Board,

Lyallpur.

Simultaneously with the inauguration of the National War Front by His Excellency, the Viceroy of India, a commendable drive has been given to the 'Food Front' movement as well. The right type of well balanced nutritious foods like fruit juice concentrates, canned fruits and vegetables and other vitamin products are as potent a factor as the right type of the latest tanks, planes, guns for maintaining the morale of the Armies and the civilian population alike. In the last Great War the shortage of food led the German to ultimately sue for peace; and this time too the vast food resources of the Allies will be one of the main decisive factors for winning the final victory.

As regards the importance of a Food Front, reference is invited to the Leader from the 'Statesman' Calcutta reproduced elsewhere in this issue. The following extract from the recent stirring address delivered by the Hon'ble Mr. N. R. Sarkar, Member for Education, Health and Lands in the Government of India, aptly gives the genesis of the movement and its vast implications:

"The bitter lessons that we are learning from it (i.e. war) serve to emphasize that a nation can neglect its agriculture only at its peril. At such a time the important problem that faces any country particularly a country which is in the front line of such gigantic war is to keep its fighting forces fully supplied with the best of food in order to sustain their health and spirits. The last war

was won by starving the enemy both at the front and at home as a result of effective British blockade. In a total war like the present one, the possibility of food shortage is to be avoided by all means because of the demoralization and discontent, it may create in the civil population. To keep them well fed is, therefore, one of the most vital of war efforts."

Leaving aside, the mention of the laudable steps that are being taken to substitute the staple foods for the non-food money crops like cotton, etc., the gardening community of the country too has a prominent role to play in the food self-sufficiency programme for each region.

Orchard is a munitions Plant.

Fruit is a rich vitamin food and of the best type too. Admitted, that any new fruit plantings would not be of any material help for war purpose, since trees set out now must take a very considerable time to fruit. Still it is imperative on our part to make an earnest effort for all round increase in the orchard yield and effect economies where we can. This demands the best we can possibly do in manuring, inter-culture, spraying, pest control, irrigation and other cultural operations to procure optimum yield. More concentration on inter-cropping in fruit orchards with vegetables, fodder crops and pulses would be yet another admirable step in this direction. It is high time to rigidly follow the "Ten Commandments on the Fruit Gardening" advocated in the

columns of the Journal previously. Our war time slogan should be :

"Each tree must give maximum yield". All drone trees must be eliminated. Let each tree pay its proportionate cost and also yield some profit. Again while effecting economies, let growers concentrate more on repairs of garden implements rather than go in for the new ones, and thus relieve steel for war effort.

Other measures for this short-range policy.

As a result of the deliberations of the recent Food Production Conference at New Delhi the following dicta for the Indian growers have been laid down as a war time policy :

"The Conference recommends that as an insurance against shortage of staple foods and with a view to improve the nutrition of the people, all available lands and adjoining homesteads should be used for the production of vegetables and quick-growing fruits, such as papayas, bananas, and melons and green fodder crops for increased production of milk. The Conference suggests that Provincial and State Governments should examine the feasi-

bility of utilising uncultivated lands near irrigation channels for the purpose of food vegetable and fodder crop cultivation.

With a view to give drive to this policy to 'grow more food' the Punjab Government have announced to make available the Crown lands for cultivation purposes on short lease basis and necessary instructions have been issued to the District authorities in the matter. The fruit growers of our province who can take up planting of these quick growing fruits and vegetables will do well to avail of these concessions.

Hobby Gardens Must Go.

Apart from the professional growers, there is an ample job work for the amateurs in the line to establish home fruits and vegetable gardens. Hobby lawn gardening and flower gardening must give way to the necessity gardening. It is time to substitute vegetables like onions, potatoes, and green vegetables and some kind of quick growing fruits in place of your favourite roses and chrysanthemum.

(Foods for freedom....fruits for victory).



Why not Learn Fruit and Vegetable Preservation at Home?

By

P. Maya Dass,

Fruit Section, Lyallpur.

Experience has shown that it is not always convenient for people desiring to join short courses in fruit and vegetable Preservation to come all the way to Lyallpur to attend the courses held periodically there. This is especially the case when women students are concerned, many of whom have, so far, been deprived of the opportunity of taking advantage of these courses at Lyallpur owing to the distance

and many other difficulties. On the other hand it is most essential for all young women to undergo this training if they aspire to be really efficient modern housewives.

In order to overcome this difficulty and to make this training within the easy reach of as many as desire it, and believing in the well-known American saying "If peo-

ple cannot come to the University, let the University go to the people," the Government Fruit Specialist, at Lyallpur has been arranging short courses in fruit and vegetable preservation at various centres in the Punjab.

During 1940-41, 21 such courses were arranged in centres scattered all over the province. These were attended by 647 students of whom no less than 323 were ladies.

The classes are usually arranged through various institutions, associations, and societies such as Girls' schools and colleges, the Y. W. C. A., the S. P. S. K., the District Fruit Growers Associations and Co-operative Thrift Societies. But classes can also be privately arranged at any place provided an attendance of at least 20 students is guaranteed by the organizers.

No charges are made for conducting these courses but the organizers are required to pay the cost of raw material, viz., fruit, sugar, fuel, etc. (This, on an average, comes to Rs. 30 for a class of 20 students for five days) and also arrange for utensils and other appliances required for the practicals. A list of these articles is supplied to the organizers before the class is started (only such utensils and appliances are used which are easily obtainable in any household).

The cost incurred in running these classes can always be made good by the sale of the products, at the conclusion of the course, as they are of excellent quality and usually sell like hot cakes.

Although the object of these classes is to give training in the preparation on home-scale of products such as fruit squashes and syrups, tomato products, jams, jellies and marmalades, candied peel, pickles and chutneys, etc., the quality of the products, which have been prepared by some of the students after attending these classes, has been excellent. Besides this,

if these products are prepared in seasons when fruit is cheap and plentiful, the cost of production is extremely low. (A bottle of orange squash or tomato juice or mango squash can be prepared at a cost of a few annas only).

The advantages of popularizing fruit and vegetable preservation on home scale are obvious. It will result in the utilization of surplus fruit and vegetables, i.e., juicy type of mangoes, tomatoes, etc., that either go to waste at present in considerable quantity or are sold at ridiculously low prices at certain seasons of the year when there are gluts in the markets. For the farmer it will mean better price for his produce and for the general public it will mean a better standard of living without any rise in the cost of living and bringing within the reach of a man of average means these products which are at present the monopoly of rich people. Above all, it will mean better health for the nation since fruit products and real fruit juice drinks are any time better than synthetic aerated drinks of which hundreds of millions of bottles are used annually in India. No wonder that encouragement of fruit and vegetable preservation is considered a matter of great national importance in all civilized countries of the world.

It is, therefore, highly desirable that these classes be conducted during certain seasons when fruit is in plenty. The most suitable seasons are December to February and again June to September. Our motto, especially during war time, should be "Eat what you can, what you can't you can can."

If you wish to organize a class in your town in the coming season, all you have to do is to fulfil the conditions mentioned above and write to the Fruit Specialist, Punjab, Lyallpur stating the number of persons who agree to attend the class and the place where it is to be held.

HEALTH NOTES

"Fatness is a Disease"

Compiled by

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According to scientific knowledge, adiposity, or surplus unessential fat, is stored in parts of the body where it is not only unwanted, but where it interferes with essential workings of other tissues and organs into whose spaces it encroaches, thus lowering their rates of metabolism, circulation and excretion.

The span of life is shortened in the obese, perhaps because normal tissue wastes are not eliminated and excreted. The fatty cells crowding into other tissues and organs, block the passage of cellular wastes into the lymph and blood streams. This is a concise picture of how serious a disease obesity is.

Mechanically, fatty tissue interferes also in other important ways with the organic activities of the body. When the heart, liver, kidneys, pancreas, skin, lungs, etc., are surrounded by excessive fatty matter, this matter produces crowding and choking effects on their cells. Therefore the organic processes of those structures are interfered with or hindered.

These vital tissues and organs become sluggish. Fatty infiltration into the vital cells of these important structures results, and various disease complications arise. Diabetes appears in some, kidney disease in others, liver disease such as gallstone formation and other types of liver failure, take place in others.

Diseases of the heart are also common in the overweight as a direct result of this condition. Fatty infiltration around the heart acts as mechanical and chemical interference on the heart. The lungs of the obese are also immured by fat as the heart is, and cause laboured breathing that is characteristic of the overweight.

The skin also becomes infiltrated or filled up with surplus fatty cells, thereby crowding the glands of the skin that excrete their characteristic sweat and oily wastes. When these wastes are retained within the body, they are as dangerous a source of tissue poisoning as is uremic poisoning.

The kidneys also are crowded in by surplus fat, and their rate of urinary excretion is cut down. Urinary poisoning of the vital tissues and organs of the body then results. Dr. J. H. Tilden very aptly stated: "Fat people excrete into their own bodies." Retained urinary wastes as well as retained sweat wastes may act as powerful irritants to vital tissues and organs, and undermine their well-being, and contribute towards the production of organic chronic disease in many forms.

In a clean body, free from tissue and cellular constipation, no chronic disease can develop easily!

The chemistry of obesity changes from physiological to pathological. The general

chemical composition of the body sooner or later becomes abnormal. A state of acidosis ensues in the blood and tissues.

Diabetes is often one of the complications that results from obesity, if allowed to continue for a prolonged time. In diabetes, the pancreas may be in a fatty, degenerated condition, which causes a failure of its special function in producing insulin that chemicalizes or burns carbohydrates normally within the system.

The liver, too, may be impaired by the fatty state to the extent of causing diabetes, because one of its functions is to store glycogen, or carbohydrate, for later use. It loses its power as a normal storehouse of glycogen when it is degenerated or infiltrated by fatty changes.

Sooner or later the heart, kidneys, blood vessels, the joints, stomach and intestines give way to disease of one form or another. Stomach and intestinal disorders, and constipation are very common in the obese, among other ailments.

The dietary of the weight-reducing regimen must of necessity be very light, and it is no hardship, even to the very extreme lovers of regular "three square" meals a day.

The foods are chosen from the classes that are low in caloric value, or low in fat, sugar, starch, and protein. Those foods are usually high in essential acid-neutralizing minerals, and in vitamins that help to act as buffers by soaking up the adipose acid wastes from the tissues of the obese. In other words, the leafy vegetables and the citrus fruits are the main reducing foods.

These foods are always used in their fresh raw state while on the reducing regimen. In cold weather, a little hot broth prepared from the non-starchy, non-sugary vegetables, is also permitted once or twice a day when the reducing curve is on the downward slant.

There comes a time during the reducing regimen when the body reaches a constant weight level despite the most restricted dietary intake even when as little as 250 to 300 calories per day are taken. The body maintains its weight even while performing exercise, including a mile or two of walking.

At this point, if reduction of weight is still indicated and desired, a short fast of twenty-four to ninety-six hours is instituted. During the fast, a minimum amount of ice-cold water and lemon juice is permitted, totalling not more than two pints per day. The fast helps the body to burn up more fat.

In a minimum of four weeks, to an average required period of eight weeks of proper treatment of obesity of any type, glandular or physiological, it is possible to do much towards restoring the body to normal. The loss of weight is on an average a pound a day, and it may really be stated that every pound of weight that the body is losing is a pound of waste!

(Extract from The Tribune, Lahore, based on the article by Alice (Chase).

Uses of Lemons:—We reproduce below an extract from the advertisement contents of the famous California brand Sunkist lemons from the Citrograph May, 1941, calling attention to the many uses to which lemons are put. We trust our readers will try the Pun'abee Kaghzi Lime to these tests and find them not wanting:—

(i) **One is for FLAVOUR:** Enjoy lemons not only for their own delicious flavour in pies and sherbets, icings and fillings—but to bring out the flavour of fish and meats, cooked fruits and vegetables, juices and tea! Make salad dressings with fresh lemon juice.

(ii) **One is for COLOUR:** Give meals gayness with lemon garnish! Serve fancy cuts all you want—but always include plenty of squeezable -lemon quarters for juice.

(iii) **One is for HEALTH:** Many people drink lemon-and-water with or between meals, upon arising or retiring. For lemons aid normal alkalinity and digestion; are an excellent source of vitamin C, good source of vitamin B₁ and the only known source of vitamin P, or citrin.

(iv) **One is for BEAUTY:** For skin: lemon juice in rinse water or ice cubes to restore the natural slight acidity after cleansings. For hair: juice of two lemons in a bowl of rinse water after shampoos to dissolve soap film and reveal true sparkling sheen.

(v) **One is for HOUSEHOLD HELP:** Lemons will sour milk, remove stains, bleach linens, clean metal and wood-work, help you in a dozen household tasks. So never be without them.

3. **Grapefruit in Place of Buttermilk.**—"The wife wanted corn bread, but we had no buttermilk. We substituted grapefruit juice and, believe it or not, that made the best corn bread we ever had. If you don't believe it, try grapefruit juice in making cake, ginger bread or cookies, and learn for yourself," he said.

"Grapefruit juice also is tops for lemon on fish and oysters—and as vinegar on

greens, and it is not only better, but less costly—and home grown," he adds. This man also reports using grapefruit juice as a substitute for cream in coffee, "The best I ever drank", he declares.

(Calif. Citro., May, 1941, p. 185).

4. **Value of Orange Juice:**—A cupful of orange juice a day, for the average child or adult, will supply sufficient vitamin C for a good normal diet, according to Mrs. Margaret Todt, home demonstration agent in Los Angeles county.

"Utilization of three to four times the amount of vitamin C required to prevent scurvy is necessary for best results in increasing resistance to infection, prevention of dental decay, and weakness of gums and blood vessels."

"Vitamin C is present in many foods but proper cooking is essential to its preservation. Orange juice is particularly advantageous because it is readily available and the amount of the vitamin present, which is called ascorbic acid, is high. Furthermore, most people like it", says Mrs. Todt.

(Calif. Citro., April 1941, p. 182).



Cultivation of Chrysanthemum

By

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It is perhaps rightly said that Chrysanthemum is the flower of the East as rose is the flower of the West. This is the most popular and commonly grown flower of our province, so much so that every year in November an exhibition of Chrysanthemum flowers is held

at Lawrence Gardens, Lahore, by the Department of Agriculture, Punjab. It is the flower that requires a good deal of labour and care for its cultivation but the sight of its bloom is so happy, pleasing and enchanting, that one feels his labours amply repaid. Considering the

popularity of *Chrysanthemum* in the province, it is advisable to write a short note on its cultivation giving broad hints on soil requirement, propagation, irrigation, manuring, etc., so that even an amateur flower lover may be able to easily grow it successfully.

There are innumerable varieties of *chrysanthemum* distinguished by shape, size and earliness, etc., but we in our province only cultivate those with yellow, red, pink, orange, light yellow and whitish red flowers.

1. Soil requirements.—*Chrysanthemum* can be grown in clayey as well as light loam soils, provided they are very rich, and care is taken to avoid excessive irrigation in the former case and that irrigation is liberal in the latter case. Soil should be well drained, i.e. at no time irrigation water should stagnate in it for any length.

2. Methods of propagation.—There are four methods of its propagation.

- (a) From suckers.
- (b) From cuttings.
- (c) From Seed.
- (d) By grafting.

By far the most popular and the commonest method of propagation with us, is by means of suckers. Plants give out young daughter suckers in the months of November and December. These are transplanted singly in a rich bed located in a well protected place in the months of April and May and are transplanted in September in pots or in other desired plots. Every care should be taken to provide shelter to these suckers during hot weather.

Cuttings may be taken during the months of January to March and implanted in light but rich soil. Soon they shall strike roots and then they can be transplanted wherever required.

Seed is sown in well prepared beds and when the seedlings attain a size of 4"-5" they are transplanted either in pots or in well prepared land. Propagation by seed is taken up only when new varieties are to be evolved.

Grafting is practice by some gardeners. They bud several varieties on one plant in order to get a variety of coloured flowers on it. It is always interesting in exhibitions.

3. Irrigation.—The growing plants should be liberally irrigated. In hot dry season, apply water after every third day and in winter season after every week. Care should be taken that water is not allowed to stand in the soil in rainy season. If leaves appear yellow and sickly, irrigation should be restricted. There is little or no danger of over irrigation so long as the foliage is bright green. The bed may be kept thoroughly weeded and aerated by hoeing.

4. Manuring.—*Chrysanthemum* is a gross feeder and needs a lot of nourishment. It should, therefore, be grown only in rich soils which are heavily manured. Frequent doses of liquid manure or artificial fertilizers may also be given to stimulate growth. Manure should not be too excessive as there is danger of overfeeding and some overfed varieties refuse to bud. When the leaves become dark coloured and very brittle, it is safe to consider that the limit in feeding has reached.

5. Blooming period.—Chrysanthemums flower during the months of October to December. The plants usually produce too many buds, more than the plants can bring into bloom. In order to have large blooms, the usual practice is to disbud the plants very vigorously leaving one flower—usually the topmost—to every shoot and not allow more than three to four such shoots per plant. Each shoot should be carefully supported by a light stake (say a "Sarkanda" stake) firmly planted in the soil as the large flowers are usually too heavy for the plant to stand erect. Both these operations, viz. nipping of buds and provision of stakes, are generally performed in the month of September, but as a

matter of fact it depends upon earliness or lateness of the varieties.

Di.budding should be practised with every newly given out branch as well, if bushy plants are desired.

A continuous and uninterrupted growth is necessary for good results, therefore the plants should never be allowed to suffer for want of either water or nourishment at any stage of their growth.

It will be interesting to mention that the insect powder known as "pyrethrum" is produced from dried flowers of *Chrysanthemum cinerariaefolium* and *Chrysanthemum Coccineum*, the former species is largely cultivated in France and the latter in California.



Date-Palm—One of the most paying Fruits

By

Mr. Amolak Ram, Agri. Assistant,
I/C. Experimental Fruit Garden,
Lyallpur.

In the 1940 annual number of the Punjab Fruit Journal, a statement showing yield and income record of Arabian dates from the year 1925 to 1939, was published. The average yield per palm of all varieties varied from 20¾ seers to 1 md. 17½ seers and the average income from 42 palms over a period of 14 years came to Rs. 326 per year, from the date fruit alone, excluding income from date suckers which were used in Government plantations. The yield from Hillawi variety which is

the best in quality was even higher than the above viz. 23½ seers to 1 md. 24½ seers per palm. That the date palm is one of the most paying fruits, the above figures speak for themselves. There are a very few other fruits which can give an income of Rs. 8/- per tree every year, taking into account both 'on' and 'off' years.

The figures of 1940 crop are still more noteworthy as these have exceeded all previous records. They are briefly given below:—

Total number of palms which bore fruit—45.

Yield of 45 palms—73 mds. 25 seers 12 chks.

Sale proceeds of the above fruit, Rs. 510|7|3.

Average yield per palm—1 md. 25 seers and 7 chhks.

Average yield per palm of Hillawi variety—1 md. 33 seers.

The highest yield obtained from a palm of Hillawi variety—4 mds. 3 seers and 8 chhks.

Although the trees are over 25 years old yet it appears that they have not passed their prime, as the results for the year 1940 show.

The yield and income obtained from the young date palms planted in the form of an avenue in the experimental garden Sq. No. 9 (given below), are also quite interesting. The palms are still young (6—12 years old) and a good number of suckers is removed from these every year.

Number of bearing palms—34.

Total yield from 34 palms—12 mds. 34 seers.

Sale proceeds of the above fruit—Rs. 70-8-0.

Highest yield obtained from a palm (Zaidi variety). 1 md. 38 seers.

The readers may, however, be cautioned that the above results have been obtained under ideal conditions of management and marketing facilities which are not available to an average fruit grower, but he should be more than satisfied if he is able to get one half or even one third of the income obtained at Lyallpur.

The main difficulty in the cultivation of date palm has been the scarcity of suckers for planting. The availability of the suckers being very limited even a fraction of the demand from the public cannot be met. The Government has under consideration a scheme for establishing a two square date plantation, the materialisation of which will satisfy the crying need of fruit growers. In the meantime, fruit growers are advised to make selections from the indigenous date palms growing in the districts of Multan, Muzaffargarh and Dera Ghazi Khan, as some of the indigenous date palms also bear fruit heavily and the quality of fruit is also quite satisfactory.



A New Punjab Industry

By

R. Mitchell of Indian Mildura

Fruit Farms, Renala Khurd

It appears that only in the last few years has modern bee-keeping interested people in Northern India although the extraction of wild honey has been a source of income to many villagers for years.

When our large orange plantation began to come into production, it was noticed that the wild bees did not always start work in real earnest until the citrus flowering was well on its way, possibly resulting in a relative loss in the setting of the fruit. One learns by experience, and it is a great pity that we did not set our minds to modern bee-keeping at once instead of trying to persuade the wild bees to live in modern hives.

This endeavour, as others have also found, proved a complete failure, for though the wild bees would be content to remain in the modern hive for a time, they would soon depart to some hedge or tree that would suit them better. We then tried to persuade the wild bees to begin work before the citrus flowering commenced by planting flowering trees which produced nectar flowers before the citrus trees themselves started flowering. Horseraddish (Sohanjna) trees were planted in the wind breaks we have between each square and these with the Loquat and Peach trees we already had, we thought, would encourage them to start work in real earnest before the citrus flowers opened. The wild bees, however, refused to break their custom unless the weather was exceptionally warm, but even then they would not come out in sufficient numbers to fertilise properly all the trees in our 500 acre fruit orchard. It was, therefore, decided to import the

domesticated bees in an endeavour to get the early citrus flowers fertilised.

In 1941, therefore, the writer got a young man trained with the Northern India Bee-Keeper's Co-operative Association which had been formed with the encouragement of Mr. F. L. Brayne in Lahore and later took him to Kashmir where he had excellent tuition under Mr. Y. Rafiqi of the Himalayan Honey House of Srinagar, a very progressive firm and probably the only one in India that has regularly been producing and selling section honey in quantity.

Before the summer of 1941 was over, Mr. Rafiqi had trained our man to such a pitch that he was given charge of one of Mr. Rafiqi's apiaries at Nagim Bagh, just outside Srinagar, and he actually dealt with an outbreak of wax moth in this apiary with such skill that none of the colonies was lost.

When the Toria in the plains began to flower in September, it was decided to bring hives down from Kashmir and ten hives were ordered to make a start. Travelling was most difficult at that time owing to the scarcity of lorries due to the recent introduction of petrol rationing in India and the hives took four days to reach Kissan. During the journey down one of the hives fell off the top of the lorry and the driver and probably the passengers also refused to wait while it was collected and put back, so only nine colonies eventually arrived at Kissan.

These colonies soon settled down and began work in real earnest on the Toria

flowers and also the Kiker (*acacia arabica*) trees but did not have time to collect sufficient stores before the cold weather set in. This resulted in a spate of robbing on a large scale and we lost two more hives through their queens being killed before this robbing was properly controlled. A further hive was lost in January when the sharp frost came down. We are thus left with only six of the original hives purchased. Two of these are still very weak with only three or four frames of brood but the other four are quite strong with seven or eight frames. The weak hives are kept separate in the meantime, in case the stronger hives are tempted to rob them.

The bees should now increase rapidly and are at present working hard on rape-seed crop (sarson), gram, turnip and garden flowers. The peach blossom is just coming out and there is every hope that all our colonies will be very powerful by

the time the citrus flowering starts. We have yet to see the effect of the work of these bees on citrus and clover and the amount of honey they can produce. We have also to see how they stand up against the attacks of bee-eaters and king-crows which arrive in large numbers next month. The approximate cost of this apiary to date including the cost of the hives, transport, equipment and labour is Rs. 650, so it is doubtful if any profit will be made this year apart from the benefit to the citrus crop. It is our intention to attempt to acclimatise the Kashmir bee to the Punjab as we consider it doubtful if any profit could be made if the bees have to be transported to cooler climes during the summer months. Domesticated bees thrive in all parts of California where the temperatures are in parts fiercer than those of the Punjab. We have some well shaded nurseries in various parts of the Farm and with careful feeding between the clover and Toria crops, say July and August, we have

Do you know? That bees can increase the yield of your fruit trees?
And that they can better the *quality* of your fruits?

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While replying please mention the Punjab Fruit Journal.

every hope that they will easily survive the hot weather. Damage from enemies has, of course, to be considered. The bee-eater and king-crows have already been mentioned and although their stay in the Punjab in large numbers is only for a short period, yet they could do much damage. The wax moth is, apparently, easily controlled if regular inspection of the hives is carried out. We stand our hives in small chatties to prevent any damage, but find a number of bees drown themselves in the water in the ordinary steep-sided chatti. Possibly a shallow-sided earthen basin would be more suitable. The yellow and brown hornets are reputed to be a great danger although the ordinary yellow wasp is said to be harmless. The Kashmir bee is quite able to protect herself against the big migratory bee and the writer has personally seen the soldiers of the hive, deal very efficiently with one that was foolish enough to try and gain admission.

As far as necessary equipment goes, most of this can be made in this country. Foundation and special equipment for section honey production have, however, in the past been imported from America where it is produced on a large scale far cheaper than it can be made here. We have tried to interest the match factories in this country in the manufacture of bee-way sections for producing section honey,

but so far none is interested. The specially refined edible wax for these sections is also imported. It seems that we will have to do without these things for the period of the war unless they can be made in this country. We intend to try and get the bees to work on an ordinary thin sheet of wax without any foundation and hope that they will respond as well as on proper foundation. At the present moment we are, as far as possible, getting the bees to work on combs from which the honey has been extracted in order to conserve the stock of foundation we have.

Our experience in this new Punjab Industry is very young indeed. It is, however, an extremely fascinating pastime and acts as a most pleasant diversion to the usual routine of a fruit grower's life. There is much available literature on the subject which affords very interesting reading but A. I. Root's "ABC and XYZ of Bee-Keeping" is generally considered the most reliable guide.

We offer our sincere co-operation to those who venture on this new industry and they have our very best wishes in the success of their venture.

(It may also interest the readers to know that Government Entomologist, Lyallpur, also arranges short courses in Bee-keeping and renders necessary advice to those interested in this industry.—Editor).

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The Choice of Rootstocks for Blood-red Orange

By

Sham Singh, Ph.D. (Bristol),

Assistant Horticulturist, Lyallpur.

On account of its superb quality, the Blood-red is the most prized variety of all kinds of sweet orange grown in the Punjab. It is more extensively grown in certain tracts than in others, and a belief is rife that it attains perfection and grows best only in some tracts. This has not, however, discouraged the prospective grower to try it elsewhere. In fact there may hardly be any orchard which does not contain a few trees of this most valued kind.

There are several strains of Blood-red, all of which are not equally good. The thin-skinned oblate form is much to be preferred over the elongated type, which is usually thick-skinned and inferior in quality. Again, the choice strain may be propagated on a number of rootstocks, all of which may not be quite compatible with it and also may not do equally well under all conditions. Therefore, the cause for disappointment may be two-fold. Firstly, it may be due to the wrong selection of the strain itself and secondly to the unsuitable rootstock used in its propagation.

With a view to determining the most suitable rootstocks for all kinds of citrus fruits grown in the Punjab, field experiments were laid out in 1937 at the Horticultural Research Sub-Station, Montgomery with the financial assistance received from the Imperial Council of Agricultural Research, India. It is too early to expect results of far reaching importance from such long-term experiments in so short a period, but the data collected for the last five years

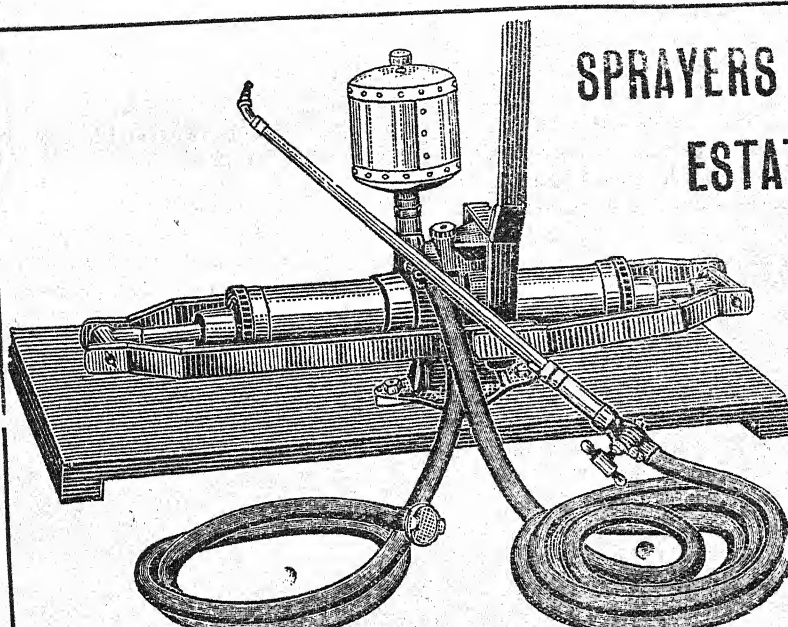
have revealed points of such practical importance in connection with the propagation of Blood-red, as deserve immediate application in nursery practice. It need hardly be mentioned that these results would prove of considerable economic value to the growers more particularly at a time like the present one when area under citrus fruits including the Blood-red variety is increasing very greatly in view of the stimulus given by the increased supply of canal water for fruit growing.

The rootstock varieties so far tried include, **Kharna Khatta**, **Jatti Khatti**, **Mitha**, **Mekari** and **Jullunduri Khatti**. One year old trees of Blood-red on each of the five above mentioned rootstocks were planted in February, 1937. Two independent and self-contained field experiments were laid out with these trees and the data on the vigour of individual trees were collected regularly year after year. These trials will have to be continued for a number of years more before final conclusions regarding the influence of rootstocks on the vigour, cropping, fruit quality and longevity of Blood-red trees could be given out with confidence, but in the meantime certain information of great economic value has emerged which has prompted the Department to convey it to the growers in this note.

The results have shown significantly that **Jatti Khatti** is outstandingly the best rootstock for Blood-red as compared with others. It is also likely that this root-

stock will maintain its present behaviour in later years as well. Even more significant fact brought out by the data is that Kharna Khatta, which proved incompatible with Blood-red in both the trials, should no longer be used in propagating this variety. Thus, although the question

of "Jatti Khatti" as the most suitable rootstock for Blood-red remains yet to be settled finally in view of the long range nature of such an experiment, the fact that Kharna Khatta and Mokari are unsuitable for Blood-red is proved even at this early stage.



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Chutneys

By

G. L. Tandon, M.Sc., Fruit Section,
Punjab Agricultural College, Lyallpur.

In India, various kinds of chutneys are prepared in the home, as well as on a commercial scale. Different recipes are followed according to the local tastes. Fruits and vegetables such as apples, peaches, damsons, plums, apricots, mangoes, turnips, cauliflowers, carrots etc. form the bases for these products. Onions, garlic, spices, etc., are added to such products to improve their flavour. Vinegar, common salt, and sugar are also added to improve taste, vinegar in addition serving as a preservative.

A good chutney, whatever its ingredients are, should have a palatable and appetising flavour. The raw materials used are cut into small pieces and cooked till they soften. Slow cooking at low temperature, far below boiling point, for a long time yields better results than a brisk one with a comparatively high temperature. Onions or garlic are added at the start, otherwise, if added towards the end, or at the time of bottling, they spoil the flavour of the product. Spices are finely powdered before they are added and sometimes vinegar extract of spices is used. By some, boiling of spices in a bag along with the fruit is also practised and this practice should be encouraged. If spices or vinegar extract are used, they should be added a little before the final stage is reached, otherwise longer boiling will cause evaporation of essential oils of spices, and of the vinegar, thus resulting in a poorly flavoured product.

Equipment.—The metallic vessels used should be non-corrodible. Vessels made of iron and copper form a black compound

with the tannins of the fruits and spices and this spoils the taste, flavour and colour of chutney. Glass lined vessels, (enamelled), monel metal, and aluminium vessels, can be used without producing any discolouration of the product.

Bottling.—This requires much care. Only clean, dry bottles which have been previously sterilized in boiling water, and are still hot, should be used for packing. If this care is not taken, the chutney usually goes bad due to fermentation taking place, the cause being the presence of some fermentative organisms adhering to the walls of uncleaned bottles. It is better if after filling and sealing bottles, the chutney is sterilized at 180°F for half an hour.

RECIPE I (a)

Sweet Apple Chutney

Sour apples	.. 5 lbs.
Sugar	.. 2 lbs.
Malt vinegar	.. 1¼ lbs.
Stoned and cut raisins	.. ½ lb.
Ginger bruised	.. 1 ounce.
Salt	.. 1 ounce.

Procedure.—Peel, core and cut apples into slices and put them into a boiling pan. Add all the ingredients except sugar and vinegar, and boil the mass slowly with little water till the apples become soft. Add sugar and vinegar and boil it again till the desired consistency is obtained (semi-solid condition as in the case of jams). Pack into bottles while hot.

RECIPE I (b)

Sweet-spiced Apple Chutney

Apples	.. 6 lbs.
Onions	.. 1 lb.
Ginger	.. ½ lb.
Sugar	.. 3 lbs.
Garlic	.. 1 Head.
Salt	.. 4 ounces.
Malt vinegar	.. 5 lbs.
Chillies	.. 1 ounce.

Procedure.—Peel, core and cut apples into thin slices. Cut onions and garlic and chop them very finely and add to apples in the boiling pan. Put the rest of the ingredients in the pan except sugar and vinegar and boil them with little water gently till apples become soft. Then add sugar and vinegar and continue boiling and pack as under Recipe I (a).

RECIPE II (a)

Sweet-spiced Apricot Chutney

Apricots	.. 2 lbs.
Lime juice	.. 2 lbs.
Sugar	.. 2 lbs.
Salt	.. 8 ounces.
Black pepper	.. 2 ounces.
Cardamom Minor	.. 1 ounce.
Cumin seeds (black)	.. 2 ounces.
Almonds peeled	.. 8 ounces.
Vinegar	.. 2 lbs.
Dry dates	.. 8 ounces.

Procedure.—Take fully ripe apricots, wash, and place them in freshly extracted lime juice. If lime juice is not available, 5.0% citric acid solution can be used. Keep apricots in the juice for 24 hours and then crush them with a ladle and pass the crushed mass through a coarse sieve to remove pits. To the pulp thus obtained add finely ground cumin seeds (black), dried dates (after washing), black pepper, sugar, salt, cardamoms and almonds. Mix all the ingredients thoroughly and expose the mixture to sun for a week or so, or till the chutney is found to be ready for use. Then add vinegar and mix it thoroughly and place it in the

sun for a week and pack it in air tight containers and put the containers in the sun occasionally.

RECIPE II (b)

Sweet and hot Apricot Chutney

Dried apricots	.. 2 lbs.
Sugar	.. 1½ lbs.
Salt	.. 1 ounce.
Vinegar	.. 1½ lbs.
Ginger	.. 1 ounce.
Chillies	.. 1 ounce.

Procedure.—Soak the apricots for 48 hours, then boil in the same water for an hour or so to make them soft. Pound ginger, chillies, salt and sugar together and mix them thoroughly with the apricots. Boil the mixture to the consistency of a jam and add vinegar. Boil it again till it thickens. When cold, fill into small jars or pots and seal.

RECIPE III (a)

Sweet Mango Chutney

Boil gently three pounds of peeled slices of raw mangoes in the same weight of sugar and little water till of the consistency of jam. Add 6 ozs. of each of sliced ginger and garlic, two ozs. of ground red chillies, one pound of cleaned raisins, 12 ozs. of vinegar, and two ozs. of salt, mix thoroughly and boil gently to a good consistency. Bottle when cool.

RECIPE III (b)

Sliced Mango Chutney

	(1)	or	(2)	or	(3)
Sliced mangoes	... 8 lbs.		5 lbs.		5 lbs.
Sugar	... 6 lbs.		5 lbs.		3½ lbs.
Almonds (Blanched & sliced)	1 lb.		...		...
Raisins (cleaned)	1 lb.		...		...
Ginger	... ½ lb.		...		...
Salt	... ¼ lb.		5 ozs.		5 ozs.
Vinegar	... 1½ lbs.		1½ lbs.		4½ lbs.
Red Chillies	... 2 ozs.		2 ozs.		½ oz.
Cinnamon	... ½ oz.		...		...
Cumin Black	...		½ oz.		...
Mustard	...		...		5 ozs.
Garlic	...		...		2 ozs.

Peel and slice mangoes. Grind chillies, ginger, cinnamon, mustard and garlic in vinegar; peel and slice blanched almonds and stem and clean raisins.

Boil sliced mangoes in a small quantity of water to make them soft. Add all the ingredients and cook on a slow fire till of the consistency of jam. Bottle when cool.

RECIPE IV

Sweet Apple and Tomato Chutney

Ripe tomatoes	.. 2 lbs.
Onions	.. ¼ lb.
Sour apples	.. 1 lb.
Raisins	.. ½ lb.
Sugar	.. ½ lb.
Ginger, Salt and chillies (all ground)	.. ¼ oz.
Vinegar	.. 10 ozs.

Procedure.—Pour boiling water over tomatoes, then skin them and cut into slices. Pare and core the apples. Remove the skin and finally chop the onions. Put all ingredients except vinegar into a deep enamelled pan, and boil down to a puree, stirring occasionally. Add vinegar and boil until desired consistency is attained, put into small pots, and seal when cold.

RECIPE V

Plum Chutney

Plums	.. 4 lbs.
Sugar	.. 2 lbs.
Vinegar	.. 1¼ lbs.
Mace (Jaivatri)	.. 1 blade.
Cloves	.. 6 in number.
Pepper Black (ground)	.. 10 in number.
Chillies	.. ¼ ounce.
Salt	.. ½ ounce.

Procedure.—Wash plums. Place them in a large enamelled pan with all the other ingredients except vinegar. Heat the mixture with small quantity of water till the plums become soft. Pass the whole mass through a coarse sieve to remove stones and skins. Boil the pulp till it thickens and add vinegar. Stir well all

the time and boil again. When finished put into jars. Seal the jars when cold.

RECIPE VI

Pear Chutney

Pears	.. 2 lbs.
Tamarind ripe	.. 8 ounces.
Sugar	.. 2 lbs.
Salt	.. 2 ounces.
Cumin seed (black)	.. 2 ounces.
Black Pepper (ground)	.. ¼ ounce.
Cloves (ground)	.. 2 lbs.
Vinegar	.. 2 lbs.

Procedure. Peel, core and cut pears into slices. Boil the slices in a small quantity of water till they become soft. In the mean time take vinegar extract of tamarind. Add all the ingredients to the boiled slices and cook to the consistency of a jam. Bottle when cold.

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The Citrus Canker and its Control in the Punjab

By

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And

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I.A.R.I., Ph.D. (Lond.),

D.I.C. (Lond.),

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Citrus canker occurs commonly in the Punjab and ranks as one of the major diseases of citrus plants in the province. In some orchards the disease has been observed to be so serious that over 60 per cent of the fruit have canker spots. The symptoms and cause of the disease and results of experiments on the control of the disease which have been carried out by the writers are described in this article.

Symptoms of the Disease

Citrus canker affects leaves, stem and fruits.

Symptoms on leaves.—On young leaves, citrus canker is first visible generally on the lower surface in small, yellowish spots. Later, the spots become visible on both surfaces of the leaves. The old lesions become brown, corky and hard. These are often circular when young and become irregular when old. The margin of the spots may be entire in young cases but is eroded in older ones. The size of the lesions varies with the species of the host attacked and with conditions of growth.

Lesions are usually 0.2 to 10 mms. in size. At first the lesions are scattered but later on two or more may coalesce and large irregular spots may be formed. Several spots may be present on a leaf. Around each spot there is a characteristic yellow halo by which the disease can be distinguished from allied diseases.

Symptoms on stem.—The canker spots on twigs are almost similar to those on the foliage. Branches more than three inches in diameter are seldom attacked while thinner branches are commonly affected.

In the Punjab, twigs of Malta orange are not seriously attacked by the disease. The branches of sour lime, however, are often severely attacked and the spots appear in such a great number that they encircle the branches and cause their death.

Symptoms on fruit.—On fruit the spots are of the same nature as on leaves. The affected fruit is disfigured by the diseased spots which often coalesce and form a raised rough surface. Diseased fruit is not only unsightly but also contains less

juice and is unsaleable. The affected fruit may drop prematurely from the trees.

[In the Punjab, the sour lime or 'Kaghzi Nimboo' (*C. aurantifolia* swingle) is most susceptible to canker. Grapefruit (*C. maxima* Var *Uvacarpa* Merrill and Lee) comes next and this is followed by species like Malta orange (*C. sihensis* Osbeck), sweet lime (*C. aurantifolia* Var *swingle*), and Sangtra (*C. nobilis* var *deliciosa* Swingle in the order in which they are mentioned—the last being almost immune under Punjab conditions.—Ed.]

Cause of the Disease

Citrus canker is a bacterial disease and is caused by the bacillus (*Phytopomonas citri* (Hasse) Bergey et al (*Pseudomonas Citri* (Hasse)). The disease is highly infectious. The causal organism is carried in the rain splashing in the affected gardens and also conveyed by contact of diseased parts of plants with healthy plants. The labourers, working in affected gardens, may spread the disease by carrying infection on their clothes to the healthy trees or healthy orchards.

The organism grows best at temperatures between 68 and 86°F, the minimum temperature for growth is 41°F and maximum 95°F. For successful infection of the host tissues and development of the disease humid conditions are very necessary. In the Punjab, therefore, though the infection by the organism can take place at any time between February and November, the conditions for the spread and development of the disease are generally most favourable during July, August and September, when humidity is high on account of monsoon rains.

Experiments on the Control of the Disease

In some countries, i.e. Florida and South Africa experience has shown that nothing short of complete destruction of the trees can completely control or check the canker disease. On the other hand, in Japan, Phillippines and Ceylon, it has been sub-

stantially reduced by repeated spraying with lime sulphur solution or Bordeaux mixture. With a view to discovering, if, under the Punjab conditions, the disease could be controlled by spraying, experiments were carried out in a garden at Chak No. 45 G. B., District Lyallpur, in 7 acres of malta orange plantation for this investigation. In this area, the average incidence of canker on fruits, as recorded in December, 1928 before the experiments were started, was 60 per cent.

The experiments were started in 1929 and were carried out for three years. Since from commercial point of view, it is the fruit which is important and not the leaves, measures were taken with a view primarily to protect the fruits from infection. Experiments were planned to find out:—

- (i) The suitable strength of Bordeaux mixture.
- (ii) The number of applications required for complete elimination of the disease.

The strengths of Bordeaux mixture applied were (1) 3:3:50, (2) 4:4:50, and (3) 5:5:50. The number of applications were 1, 2 and 3. Controls which consisted of unsprayed plants were kept in each set. The experiment was replicated thrice in randomised plots in five acres of the plantation. In the other 2 acres spraying was done with 4:4:50 Bordeaux mixture and all the trees except the controls were sprayed three times and the experiment was triplicated.

The three sprayings were applied at the following times:—

The first application was given in the middle of May, the second in the end of July and the third in the end of September. In the case of those trees that were to receive one spraying only, the second and third sprayings were omitted and for those trees which were to receive two sprayings only, the third was omitted.

Counts of healthy and diseased fruit in the end of December, 1929. The results on all the experimental trees were made are given in Table I.

TABLE I
Results of spraying experiments in 1929.

Strength of Bordeaux mixture.	One Spraying.		Two Sprayings.		Three Sprayings.	
	No. of fruits observed.	Percentage of diseased fruit.	No. of fruits observed.	Percentage of diseased fruit.	No. of fruits observed.	Percentage of diseased fruit.
3:3:50	879	17.2	913	7.7	2300	13.2
4:4:50	836	17.7	1027	4.8	3578	8.2
5:5:50	Observations could not be recorded.		1365	7.8	2477	10.8
Control	645	27.9	1075	24.8	2120	25.2

The results show that one spraying reduced the disease on the fruit from 28 to 18 per cent. Two and three sprayings reduced the infection from about 25 per cent to about 10 per cent. Though no definite counts of diseased leaves were taken, the general observation showed that the disease on the leaves was not reduced to any appreciable extent, even on the trees which received three sprayings.

In 1930, the experiment was repeated but this year all the plots except the control were given three sprayings with 4:4:50 Bordeaux mixture. Counts of healthy and diseased fruit were taken in the end of December as during the previous year. The results are given in Table II.

TABLE II
Results of spraying experiments in 1930.

Treatment.	Total.	Percentage of severely affected fruit.	Percentage of partially affected fruit.	Percentage of total attack.
Bordeaux mixture 4:4:50 three sprayings.	59,511	1.1	4.6	5.7
Control (Unsprayed).	10,000	10.32	13.8	24.1

The results show that the infection of fruits on the trees which received one,

two or three sprayings in 1929 and which were sprayed three times during 1930 was reduced from 24 to about 6 per cent. The infection on the leaves was not reduced to any appreciable extent. It appeared that 6 per cent of the disease which was left unsuppressed had probably been caused by transmission from the adjoining diseased plants which were left as control. It was therefore thought that for the complete elimination of the disease the whole area should be sprayed enbloc and also to minimise the source of fresh infection, the diseased leaves should be picked up and burnt before spraying the trees.

In 1931, therefore, all the diseased leaves on all the trees were removed and then the whole garden was sprayed thrice with 4:4:50 Bordeaux mixture, the time of applications being almost the same as during the previous years. The observations recorded in the end of December, 1931 showed that out of 80,000 fruits on the trees only 610 were diseased or in other words the disease was reduced to less than 1 per cent. On unsprayed trees in another portion of the garden the percentage of infected fruit was 25.0. Since then Malta orange plants in citrus orchards in Lyallpur, Montgomery, Sargodha and other districts of the province have been sprayed and the results have been very promising. In the diseased gardens in which spraying was done systematically for two consecu-

tive years after removing diseased leaves, the disease was reduced to traces. Observations have, however, shown that an additional spraying some time in December to February, i.e. after picking the fruit and before the fresh growth starts, helps considerably in reducing the amount of infection on the leaves and consequently on the fruits. Furthermore this spraying also helps to check withertip disease (*Colletotrichum gloeosporioides*). Efforts to control the disease on severely affected **Kaghzi nimboo**, plants (*Citrus aurantiifolia*) have not met with any success. Sour lime is very susceptible to the canker disease. Annual cost of the operations for the control of canker per acre of citrus plantation was worked out as below :—

- | | |
|---|--------------|
| (1) Labour for picking diseased leaves. | = Rs. 4\|8\|- |
| (2) Cost of 4 sprayings. | = Rs. 17\|1\|- |
| Total cost involved= | Rs. 21\|8\|- |

Experience has shown that if the infected trees are sprayed four times annually during the first two years, the number of sprayings can be safely reduced to two during subsequent years. The first two sprayings may then be omitted but the last two sprayings cannot be dispensed with. The average cost of carrying out these operations will not therefore remain at the high initial cost referred to above, but would be reduced to about half during later years.

As these operations will also serve to control withertip and the premature dropping of blossoms and fruit, caused by *Colletotrichum gloeosporioides*, the adoption of these operations as a garden routine for combating both the maladies is very strongly advocated in the citrus orchards of the Punjab. The recommendations are summarised below :—

- (1) The affected leaves and branches should be carefully pruned and burnt.
- (2) Trees should be sprayed four times during the year with Bordeaux mixture (4:4:50). The first application should be given during the period from the begin-

ning of January to about the middle of February; the second about the end of May; the third in July and the fourth in September. During subsequent years, the first two sprayings may be omitted if the intensity of the disease has declined considerably.

(3) When establishing new plantation, nursery plants, must be carefully examined to ensure the freedom from citrus canker infection. As some of the nursery growers remove infected leaves from the young stock just before selling, plants should be only purchased from nurseries certified to be free from the disease by the staff of the Agricultural Department. Nursery growers are advised to keep down the disease by removing all infected leaves and branches and then spraying them with 4:4:50 Bordeaux mixture once every two months.

Further experiments with a view to finding out cheaper and more effective methods of controlling the disease are in progress and an account of these will be published.

IMPORTANT NOTE



The Chief Editor does not hold himself responsible for the views expressed in the articles published by various contributors in this Journal.

A Novel Mango Graft

By

S. R. Verma, M.Sc.,

Superintendent, Hill

Orchards, Kandaghat,

(Patiala State).

As promised in my previous article, "A NOVEL MANGO GRAFT" published in the Punjab Fruit Journal, Vol. V, No. 18, April, 1941, I beg to present herewith the result of our this year's efforts with 36 Mango grafts made at our Panjaur Orchard as follows:—

Three dozen good stones of our ordinary seedling mango were embedded in moss grass (which was kept constantly moist) on 16-8-1941 and the sprouts thus obtained were grafted, by our usual method of inarching, on 30-9-1941 with exactly a dozen scion shoots each of sabaz Panjaur, Creeper and Darbhanga mango varieties respectively. The moss-covered sprouted stones were kept hanging under the scion trees in bunches of two's, three's or even more, depending upon the number of grafts that could be made close together in small straw covers or small straw baskets with a little sprinkling of pot-soil in each. This soil helped in conserving the moisture in the moss, and also in supplying the food nutrients to the stock-roots.

On 15-12-1941, grafts were separated from the scion trees and were potted immediately. Out of these 36 grafts, 34 survived and are still living. The ease and success of this method last year, tempted our Panjaur grafter this year to use as big scion-shoots as appealed to his fancy. But this is a mistake. There is no doubt that the bigger the scion-shoot the bigger is the grafted-tree produced, but proportionately the larger is the percentage of

failures to be expected in the "Take" at the same time. According to our actual observations, therefore, the best size of scion-shoot is the one which is not unwieldy, or still better, which is rather inclined to be lighter in spread than what the stock can easily support.

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Control of Fruit and Vegetable Seed Supply

By

S. S. Bhat, M. Ag., Horticulturist
to Government, Baroda.

[There appeared an article under the caption 'Control of Fruit and Vegetable seed supply in India' by S. S. Bhat, M. Ag., Horticulturist to Government, Baroda, in "The Rural India" Vol. V, No. 2, February, 1942. Readers and fruit growers interested in the subject can refer to the article in its entirety. However, for their benefit, a summary of the article is given below.—Ed.]

"The supply of horticultural seeds and plants in India is chiefly in the hands of commercial nurserymen and seedstores which are not controlled. Due to ignorance and poverty of growers, and limited outlook and low business mentality of many suppliers, the quality of fruits and vegetables raised from low quality of seeds and plants has suffered much. Measures to control the supply of seeds and plants seem to require a survey and study of the existing varieties, on the basis of which the most economic and high quality varieties only can be selected, and further planting limited to them. The method of propagation and nursery operations should be regulated with a view to bring about uniformity and to check the spread of diseases and pests. The seeds and plants should have grade specifications worked out for each kind to facilitate control and adherence to them. The commercial nurseries and seed stores should be licensed and a levy of one anna or half an anna per plant should be made for inspecting and labelling the plants and seed packets they sell. The system of voluntary registration has not worked satisfactorily, and it is suggested that all these control measures should be legalised under a **Plants and**

Seeds Supply Act. The control of growers' plantations is also recommended to check the spread of undesirable and uneconomic varieties as also diseases and pests. An intensive campaign of education and propaganda in favour of the selected good varieties and the control measures, should be undertaken to overcome any lapse and opposition."

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Seasonal Notes on work among bees in the plains

By

L. N. Kaul.

[In pursuance of the decision of the Managing Committee Meeting of the Punjab P. C. Fruit Development Board held on May 16, 1942, regarding encouraging of bee-keeping industry as an adjunct to Fruit Industry, a new section devoted to "Seasonal Notes on bee-keeping" has been introduced in the Punjab Fruit Journal beginning with this issue. A separate article on bee-keeping titled "A new Punjab Industry" is also appearing elsewhere in this issue—Editor.]

July.—Dearth of Nectar causes cessation of brood rearing. Watch out for absconding queens and resort to feeding if necessary. Guard against Hornets (*Vespa Magnifica*) Bee-eaters, King Crows and wax moth.

August.—Hives should be inspected twice a week during July and August and kept

clean. If small black excreta is seen, guard against wax moth and inspect and clean very thoroughly and regularly.

September.—Colonies should begin brood rearing in earnest in this month. Feeding should be stopped as colonies become strong as there are plenty of nectar and pollen.

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سنگترہ مالٹا کی قسم کے پودہ جات کی خرید کیلئے
محکمہ ہائے زراعت پنجاب اور شمال مغربی صوبہ سرحد سے
منظور شدہ اور پنجاب فروٹ نمائش میں اول درجہ و
دیگر انعامات حاصل کرنے والا، سائنس کے اصولوں پر
قائم کردہ اور بڑے پیمانہ کا قابل اعتماد ذخیرہ (زمرہ ۱)۔
— تشریف لائیے اور ملاحظہ فرمائیے۔

دیگر تفصیلات و نرخ نامہ مفت طلب کیجیے
دی پاپولر نرسریز و فروٹ فارم گوچرانوالہ (پنجاب)

Chronicle of the Fruit World (Indian Section)

By

K. L. Kohli, M.A., L.S.G.D.,

Assistant Secretary,

Pb. P. C. Fruit Development Board,

Lyallpur.

1. Punjab Summer Fruit Shows.—The following fruit shows were held in the month of July 1942.

- (1) Karnal District Mango Show on 12th and 13th.
- (2) Semi-Provincial Mango Fruit Show at Hoshiarpur on 13th and 14th.
- (3) Lyallpur Mango and Date Show on 17th and 18th.
- (4) Muzaffargarh Mango and Date Show on 29th and 30th.
- (5) Multan Divisional Fruit Show (Mango and Dates) on 25th and 26th.

2. U. P. Fruit Show.—Under the auspices of the U. P. Fruit Development Board U. P. Fruit Show was held from 11th to 13th July, 1942, at Lucknow. Mr. P. W. Marsh, C.S.I., C.I.E., I.C.S., Advisor to His Excellency the Governor (Revenue), presided over the prize distribution.

3. Dried Bananas for Troops.—An Indent for 3,500 lbs. of dried bananas for supply to Indian troops has been received by the Food-Stuffs Directorate of the Supply Department Government of India.

Samples produced by two firms have already been approved by the Military Food Laboratory. Further sources of supply are being developed.

(Indian Information, April 1, 1942, page 347).

4. Date and Mango Industry of Muzaffargarh faced with a Transport Crisis.—

This year on account of curtailment of transport facilities due to war, the promising mango and date industry of Muzaffargarh district is faced with a crisis. The following extract from the resolution on the subject passed in a recent meeting of the fruit growers of the district, aptly summarises the exact position.

"Resolved unanimously that the fruit growers of Muzaffargarh request the benign Government to move the N. W. R. authorities to make necessary arrangements, as they used to do before in respect of export of mango and date fruits from 15th June to 15th September 1942 in order to enable the fruit growers to earn their livelihood and to pay Government dues in time.

Resolved unanimously that the owners of lorries and trucks be allowed sufficient quantities of petrol during this short period of 3 months to enable the fruit growers to export their said fruits from Jatoi, Shahr Sultan, Alipur, Khairpur, Rohillanwali, Kinjhir and Khangarh, where the said fruits are grown in abundance and which places are situated far off from Muzaffargarh, N. W. R."

5. New economic crops.—From an illuminating article in the Indian Farming May, 1942 (page 277—280), on the above

subject, the following information is being reproduced which, it is hoped, would be of practical interest to the fruit growers.

Papaya as source of papain.

Papaya (*Carica papaya*) is a native of Central America and the West Indies. Commercially it is important as a source of papain, a digestive enzyme resembling animal papain, and used as a remedy for dyspepsia. Papain is obtained from the juice of the fruits. At the present time the only country producing papain on a commercial scale is Ceylon, which in 1932 exported 45,575 lbs. of papain to the United States of America, 16,022 lbs. to the United Kingdom and 1,555 lbs. to France.

In India papaya cultivation has been successful in Madras, Bihar, Bengal, Bombay and the United Provinces, but no large-scale plantations have been tried for the manufacture of papain. A number of

high-yielding varieties have been selected for India; of these special mention may be made of Washington Giant, Hawaii, Ceylon Long, Ranchi Mammoth and Calcutta.

Olive.—The olive (*Olea europea*) is a native of western Asia. *O. cuspidata* is the wild olive of Sind, North-Western Himalayas and Kashmir. The ripe fruit properly salted is one of the most sustaining foods known in Europe, where it takes the place of opium, but is without the evils of the drug. Olive oil is one of the finest known in commerce as a food and as a lubricant in wool spinning. The true olive is a very hardy tree, is drought-resistant and thrives well in dry climates with mild winters. Loamy soils are most suitable for its cultivation.

Sago.—Sago palm (*Metoroxylon Sagus*) is a native of Malaya. Sago has the characters of starch, is nutritive, easily digestible and hence given during conva-

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lescence in acute diseases. The tree flourishes in low, marshy places.

England imports 4,000 tons of sago annually.

Pistachio.—Pistachio (*Pistacia Vera*) or Pista has its original home in Asia Minor. It is a small tree forming forests, usually on sandstone formations, in Syria, Mesopotamia and Khorasan. The fruit yields resin and oil, and is also used in confectionery. Most of the supplies of pistachio nuts are received in India from Persia, Palestine and other neighbouring countries.

From the recorded evidence of the existence of this tree in Rawalpindi, Srinagar and Kashmir, there appears to be no reason why with a little trouble, the cultivation of this valuable tree should not be carried on with success, at least along the whole of the north-western frontier.

It has been observed that the seedling plants do not usually fruit. In this direction budding and grafting may help in overcoming this difficulty.

6. New Food from "Amla".—A new food from the Indian gooseberry (amla)—(*Phyllanthus Emblica*) is being manufactured at the Nutrition Research Laboratories, Coonoor. Large quantities of gooseberries are arriving from the neighbouring districts and those are being powdered here and then sent to other parts of India for conversion into tablet form. The new food is intended, among other purposes, to be sent to famine camps and desert areas where vegetables cannot be obtained.

(Food Manufacture Vol. 26. No. 12,
December 1941,

ALL ABOUT KASHMIR FRUIT INDUSTRY

Readers of the Punjab Fruit Journal are informed that only a few copies of the illuminating and comprehensive Bulletin dealing with the Fruit Industry of Kashmir, published by the Punjab Fruit Development Board, are left in stock. This Bulletin is based on the observations made by the Fruit Specialist, Punjab, and the Assistant Fruit Specialist during their visit to Kashmir State.

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**THE PUNJAB FRUIT DEVELOPMENT BOARD,
LYALLPUR.**

Horticultural Abstracts

By

M. Musahib-ud-Din, Fruit Section,

Lyallpur.

1. 'THINNING OF FRUIT TREES WILL ENSURE BETTER ALL-ROUND CROP'

by Waters, E.F.

A discussion on thinning, the objects of which are summarized as follows: (1) To increase size, quality and uniformity of fruits; (2) to reduce disease and insect injury to fruit and trees by making them more accessible to spray; (3) to prevent breakage of limbs and branches. A few general rules are given. Thin 3-4 weeks after petal fall or when the fruit (e.g. apples) is approximately 1 inch in diameter, removing very small, diseased or misshapen fruits always. Thin stone fruit so that no two fruits will touch when mature. With apples and pears divide the tree into three zones. In the upper zone reduce all bud clusters to singles, in the middle zone to twos and in the lower zone to threes. In the top zone in addition all fruit should be removed from the top of the main limbs for a distance of 15 inches to induce good leader growth. On pronounced alternate bearing varieties it is suggested that to leave fruit only on each alternate spur would encourage annual bearing. The fruit remaining must not be unduly disturbed in the operation or it may drop later on.

('Horticultural Abstracts' Vol. XII, No. 1.)

2. WINDBREAKS FOR ORCHARD PROTECTION By Wahlberg, H. E.

The need for windbreaks as part of the orchard enterprise in S. California is stressed. Wind-breaks should form part

of a unified plan throughout the district for maximum effect rather than be the piece-meal efforts of isolated holdings. The relation between height and windbreak is about 1:4, i.e. a 100 ft. high windbreak will protect 400 ft. of orchard or 13-15 tree rows. For example, a square 10-acre orchard would be almost perfectly protected by a central windbreak situated 330 feet, from the outside windbreak. The eucalyptus and Monterey cypress will probably be superseded as windbreak trees by the Arizona cypress and possibly the Forbes cypress, indigenous to Orange county. There should be ample room between the windbreak and the property line to allow of good root development.

(Calif. Citrogr., 1941, Vol. 26.)

3. A NUTRITIVE INDEX OF FRUITS By Morgan, A. F.

Fruits are not high caloric foods nor protein rich foods. They are rich in mineral constituents in comparison with their energy value. They are the outstanding source of vitamin C. They contain the B vitamin, namely B₁ riboflavin and B₆ or pyridoxin. They are in some cases rich in carotene, the provitamin A. Thus carotene is present in large amounts in apricots, prunes and yellow peaches. Fruits, then, obviously contribute chiefly mineral and vitamins to the diet. After discussing the varying amounts of vitamins, minerals and calories afforded by them the author classes the more common fruits roughly as follows:—(1) Fruits providing substantial amounts of ascorbic acid (in descending order of content)—

oranges, strawberries, lemons, grapefruits, tomatoes. (2) Fruit providing substantial amounts of vitamin A—dried apricots, prunes and peaches; fresh apricots, tomatoes and peaches. (3) Fruits affording miscellaneous, mainly mineral, value—dried figs, apples, raisins, dates, pears, and fresh or canned pineapple, berry fruits cherries, plums, grapes, apples, bananas, pears and water melons.

(Fruit Prod. J. 1941, Vol. 21.)

4. VITAMIN TREES

Vitamin B Found Concentrated in Buds of Trees

Large quantities of vitamin B₁, the "morale vitamin" which exercises a bene-

ficial effect on the human nervous system, have been found in the buds and leaves of many common American trees, by Yale University botanists. The scientists found heavy concentrations of the substance in the buds of oak, red maple, horse chestnut, elm, sycamore, and white pine trees, according to Science Service.

"Although vitamin B₁ is now produced by synthetic chemical processes, this discovery points to a large natural source of Vitamin B₁," stated Prof. Paul R. Burkholder. "This finding may offer a clue to the source of essential vitamins for many forest animals."

(Scientific American, November, 1941.)

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Annals of the Board

By

K. L. Kohli, M.A , L.S.G.D.,

Assistant Secretary,

Pb. P. C. Fruit Development Board,

Lyallpur.

During this quarter (i) the Nursery (ii) the Publication (iii) the Finance (iv) the Irrigation Standing Committees of the Board met on 13-4-42 while the Managing Committee met on 16-5-42. The salient proceedings of these meetings as confirmed by the Managing Committee are reported as under;—

1. Commendable progress of the Nursery Scheme.—In addition to supplying 6,640 plants in Spring 1941 and 857 in Monsoon, 1941, 3,552 citrus plants were supplied from the Board's nursery in Spring, 1942. Altogether, 2,437 mango grafts were also supplied this year, (as against 279 in Spring, 1941). Orders for 6,127 plants were re-directed to the registered nurseries in Spring 1942. 23,305 plants were budded in Spring 1942, percentage of success being 78. 40,000, Khatri plants were transplanted at Lyallpur and 20,000 more would be fit for transplantation in Monsoon, 1942.

2. Mango Budding Work to be taken up.—Decided to request the Government that more attention should be paid to develop mango culture in the Punjab and that the Board may engage 3 or 4 malis who may be trained in mango budding at Lyallpur to prove useful to the members in top-working their mangoes by budding.

3. Leasing of Land for the Lyallpur Nursery.—The terms about leasing 4.9 acres of land from the Irrigation Depart-

ment at Lyallpur for extension of the Central Nursery of the Board were confirmed.

4. Continued Progress of the Punjab Fruit Journal.—The number of the subscribers of the Journal including members, associates on 16-4-42 was 840 as against 775 on 15-12-41. The January 1942 Number of the Journal devoted exclusively to the important aspects of the fruit and vegetable preservation industry can safely be called a landmark in the annals of this Journal.

5. Presentation of a Souvenir.—The Committee acknowledged with appreciation the distinguished and meritorious services rendered by S. B. S. Lal Singh, the Hony. Secretary of the Board in extending the beneficent programmes of the Board, especially in the sphere of publication activities relating to the Punjab Fruit Journal and bringing the same on a permanent business footing, and decided that by way of recognition of the most valuable services rendered by S. B. Sardar Lal Singh as its Chief Editor, he may be presented a gold medal or any other suitable souvenir, by the Board.

6. Budget.—It is noted that the closing year ending 31st March, 1942 disclosed a total income of Rs. 19,606/- and a corresponding expenditure of Rs. 18,122/- giving a surplus of Rs. 1,484/-. In the light of the same the committee voted the under-

noted budget for the year ending 31st March, 1943.

Section.	Income. Rs.	Expenditure. Rs.	Surplus or De- ficit. Rs.
General	6,710	4,280	Sur. 2,430
Publication	3,590	4,330	Def. 740
Nursery	11,000	9,420	Sur. 1,580
	21,300	18,030	Sur. 3,270

7. **Bee Keeping.**—A special Sub-Committee was constituted to popularise bee-keeping in the province as an important adjunct to the fruit industry.

8. **Social and Personal.**—(i) Outstanding, in many respects in the King's Birth-

day Honours list is the conferment of Knighthood on the Hon'ble Mr. Justice Bakshi Tek Chand, Acting Chief Justice of the Lahore High Court and the distinguished Life Member and ex-Vice-President of the Punjab P. C. Fruit Development Board.

(ii) S. B. Hari Singh, Rtd. Deputy Commissioner Criminal Tribes, another prominent member of the Managing Committee, has been appointed Joint Secretary, the Punjab War Board, Lahore.

(iii) R. B. L. Parsash Chand Mehra, the distinguished member of the Managing Committee of the Board, has been elected for the second time as President of the Amritsar Municipal Committee.

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A Directory of Approved Nurseries, Seed Houses and Gardening Firms

With a view to place before the fruit growing public of various provinces a list of reliable Nurseries, Seed Houses and Gardening Firms, the Punjab Fruit Development Board introduced the registration scheme recently, details of which have already been published in the October 1940 issue of this journal. The criterion of reliability, fixed by the Board, is that the firm concerned must be able to procure a favourable report from the Agricultural Department of the Province to which it belongs.

Under this Scheme the following firms have so far been registered and they guarantee to supply reliable healthy plants, seeds, etc., viz. true to parentage and free from insect and fungus pests.

PUNJAB

Nurseries

1. M/s. Brij Lal Orchards, Pathankote.
2. The Manager, Jamalpur Fruit Farm, via Sarna Railway Station, near Pathankote.
3. M/s. Popular Nurseries and Fruit Farm, Gujranwala.
4. M/s. Indian Mildura Fruit Farms, Ltd. Renala Khurd, Distt. Montgomery.
5. Bakhshi Kanhya Lal, Advocate, Gujranwala.
6. Ferozsons gardens and Nurseries, village Mahmud Buti, near Hydro-Electric Power Station, Shalimar, Lahore. (Lahore office 365, Circular Road, Phone 2926.)
7. Khalsa College Nursery, Amritsar.

8. Ch. Siraj Din, Plant Seller, Lawrence Road, Lahore.
9. Kot Ganesh Das Farm, Mian Channu, District Multan.
10. Parkash Nursery, Muzaffargarh, Punjab.
11. Mushtaq Gardens and Nursery, Mian Channu, District Multan.
12. S. Kartar Singh Diwana, Diwana Fruit Farm, Chak No. 370, Sardarwala, P. O. Parkarabad, Distt. Sheikhupura, via, Buchiana (N.W.R.).
13. M/s. B. B. Bannerji and Sons, Nurserymen, Saraswati Gardens, Simla E.

14. Rajindra Nursery and Garden, Civil Lines, Gujranwala.

15. Messrs. Latif Gardens, Panipat.

U. P.

Nurseries

1. M/s. L. R. Brothers, Saharanpur.
2. Henbane Nursery, Saharanpur.
3. The Paramount Nursery, Kuarsi, Aligarh (U.P.)

Seed Houses

1. The American Seed Stores, Fyzabad.

BIHAR

Nurseries

1. M/s. Reghunandan Sah and Sons, Govindpuri, Muzzafarpur.

BOMBAY**Seed Houses**

- 1 M/s. Pestonji P. Focha and Sons, 8, Napier Road, Poona.
- 2 M/s. N. Cooper and Co. 21, Wellesley Road, Poona, 1.

Nurseries

- 3 M/s. Garden Supplies Co., Ville Parle, Bombay.

MADRAS**Nurseries**

- 1 M/s. E. R. Sampanji and Sons, Lalbagh, Fort Road, Bangalore City.

Gardening Firm

- 2 M/s. Standard Furniture Co., Kalai, Malabar (India.)

The Principal Feature of the next issue

[In October, 1942 issue an article entitled "Mango Budding in Situ—a new technique likely to revolutionise mango industry," would be published. This would give in details the method of establishing new mango plantations of choice mango varieties at a very little cost as well as the method of converting old seedling mango trees of inferior quality into better commercial varieties. The new method is expected to revolutionise the mango industry of the Punjab and would be welcome by mango enthusiasts who at present are spending thousands of rupees in an effort to establish their mango plantations of superior varieties.—Editor.]

OBITUARY

We sorrowfully record the sad demise of Mr. A. H. Lee of Bundrole Orchards Kulu—one of the pioneer fruit growers of the Kulu valley who did very useful work for encouraging the Fruit Industry of the Valley which has undoubtedly suffered an irreparable loss by his death.

The PUNJAB FRUIT JOURNAL

Vol. VI]

Lyallpur, October, 1942.

[No. 24

MANGO BUDDING IN SITU—

A new technique likely to revolutionise
mango industry

By

Lal Singh, B.Sc. (Hons.), M.Sc. (Calif.),
Fruit Specialist, Punjab, Lyallpur,
and

Abdul Aziz Khan, B.Sc. (Agri.),
Ph.D. (Bristol),
Fruit Section, Lyallpur.

Dietetic Importance of Mango.

Mango is rightly called "The king of all Fruits," not only due to its delicious taste and high flavour, but also due to its dietetic value. Nothing more eloquently attests the dietetic importance of this fruit than the words of the Turkoman poet Amir Khusro who wrote the following in Persian Verse during the reign of Mohd. Tughlak Shah (1325—1351).

"The mango is the pride of the garden,
The choicest fruit of Hindustan.

Other fruits are content to eat when
ripe

But the mango is good in all stages
of growth."

At present, the value of this fruit is being greatly appreciated especially due to its vitamin contents which are so necessary

for health. Perry and Zilva (Marketing Board, England Bulletin No. 49, 1932) found that Indian mangoes are very rich in vitamin A and C. Alphonso variety, according to their findings, contains more vitamin C than Citrus fruit juices. They recommend that even one small mango fruit should be considered more than enough to supply the daily requirements of vitamin A and C in a balanced human diet. Guha and Chakravarty (Indian Journal of Medical Research, 1933), working on three varieties of Indian Mango, report that all these varieties are potent sources of Vitamin A, fairly good sources of vitamins B1 and B2 and vitamin C.

Mango is a fruit both for the rich and the poor. Choicest varieties and those ripening out of season are sold at a high or even fancy price ranging from -4/- to Re. 1/- per seer, which only rich people

STOP PRESS

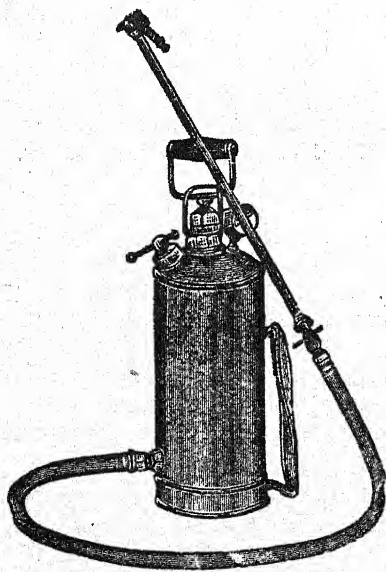
It is a great pleasure to announce that His Highness the Maharaja-adhiraj of Patiala, has very kindly agreed to become a Life Patron of the Punjab P. C. Fruit Development Board Lyallpur, and has donated a special contribution of Rs. 1000/- towards the funds of the Board.

can afford to buy. Juicy or sucking types which are sold for a rupee or two or even less per maund are, of course, within the means of even poor people. In fact, during the mango season a large number of poor people practically subsist on mango fruit—a juicy type and of rather inferior quality which is available at dirt cheap price in the mango growing tracts of the Punjab.

The popularity of the fruit is bound to increase still further as the manufacture of attractive and excellent products like canned mangoes, mango squash, mango chutney, dried mango juice, etc., assumes commercial importance. These products have been prepared and standardised at Lyallpur, as a part of the scheme financed by the Imperial Council of Agricultural Research.

Economic Importance of Mango.

Mango fruit is of special economic importance in India as it is most widely grown in this country and occupies area amounting to lakhs of acres. In Madras Presidency alone, it occupies an area of 240,652 acres out of a total area of a little over 400,000 acres planted to all types of fruits. (Madras Agri. Journal, June, 1940). Even other provinces in India like Bombay Presidency, Bihar, Orissa and U. P. are also equally famous for this fruit. In the Punjab, it is grown to the extent of about 40,000 acres in compact regular plantations in addition to lakhs of trees growing in scattered condition along road sides, water-channels, canal banks, and borders of fields. The importance of this fruit in the Punjab can be judged from the fact that it occupies 57 per cent. of the total area under all kinds of fruits



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planted to regular plantations and if we include all the trees which are growing in scattered condition, the percentage of its area will be still higher.

Serious drawbacks in seedling plantations.

It will be no exaggeration to say that 99 per cent. of the mango trees in India are of seedling origin consisting of good, bad and indifferent varieties. Producing mango trees from seed is an easy method and is consequently followed in India on a very large scale. But the most serious drawback in this system of propagation is that seedling trees generally do not come true to the parent trees and it is seldom to find in any orchard two trees of seedling origin exactly alike. There are some trees of outstanding merit in the Punjab, which yield fruit worth Rs. 100/- to Rs. 500/- per tree, per year. Thousands of seeds of these trees have been sown by

people hoping to get trees similar to parent trees but all in vain. This was, of course, bound to happen. And it is for this reason that in case of most fruit trees the universal practice with the enlightened fruit growers is to stock their gardens with trees that are vegetatively propagated, i.e., by budding, grafting etc., as such trees can be expected to come true to the parent plants. In mango cultivation, however, the practice of producing trees from seeds still predominates as this fruit does not easily lend itself to some economical methods of vegetative propagation. But it is obvious that unless vegetative propagation replaces seedling production, it will be futile to expect any great improvement in mango cultivation, i.e., establishment of commercial plantations of standard varieties or adoption of standardised grading and packing of fruit or production of definite quality fruit for defi-

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nite purposes like table use, canning, squash making, etc.

Vegetative propagation of mangoes.

The only vegetative method by which mango is at present propagated on a commercial scale is enarching which has, however, many serious defects. It is very tedious, time consuming, cumbersome and expensive method as it entails, (a) production of seedlings in the nursery which take one year in the Punjab to obtain suitable size for enarching, (b) potting the stock seedlings which, apart from expenditure on pots, also results in some casualties, (c) bringing the potted seedlings to the scion trees which entails considerable expense especially when the scion trees happen to be scattered over a wide area, (d) providing scaffoldings or 'Machans' high enough to hold the pots near the shoots of the parent trees especially when the latter are old and branches near the

ground are not available for enarching, (e) conducting enarching operation which is very tedious and slow, (f) watering the potted seedlings twice daily for about 4 months till the grafts have united, (g) severing the grafts from mother trees and storing them for at least 6 months before these are sent out for planting, (h) difficulty of getting enough number of grafts from a scion tree, as a whole shoot is sacrificed in securing a single graft, unlike budding in which individual buds of a single shoot can produce so many plants, (i) and the difficulty of procuring grafts from trees growing in out of the way places or at a long distance. During all these operations, a great number of casualties occurs, thus raising the cost of production to a high level. Consequently, it is no wonder that most nursery men are inclined to charge fancy prices for their choice varieties.

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In spite of heavy expenditure incurred by the growers on the price of grafts, packing and freight charges, they have to face disappointment as the grafts seldom succeed especially in the warm canal colonies of the Punjab, or the success is appallingly low for various reasons such as, (a) unhealthy, pot bound and improperly united grafts received some time from the nursery men; (b) improper packing; (c) careless handling of grafts in transit; (d) soil and climatic differences in places where the grafts are produced and where they are to be planted in gardens; (e) carelessness at the time of transplanting or lack of proper attention after the grafts are set in their permanent places in the garden, as these grafted plants are far more delicate and require far greater attention than seedling trees. Sardar Bahadur Dilbagh Singh, Honorary Magistrate, the greatest mango enthusi-

ast known to the authors, had to spend thousands of rupees in establishing at Lyallpur a few acres of mango plantation of some choice varieties. But this sort of enterprise can never be a commercial success in view of heavy expenditure involved.

In spite of all the defects in enarching, it is still followed in India on a commercial scale although sporadic attempts have been made to substitute it with budding, but without any commercial success. From the personal experience of the senior author in Egypt and a letter received from Florida, it can be definitely claimed that budding of mango even in those countries has not gained popularity with nurserymen due to various difficulties involved in making this a commercial success although this method of propagation was reported to be successful in both these

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countries. In fact, in one of the recent Horticultural meetings of the Imperial Council of Agricultural Research, presided over by Dr. Burns, Agricultural Commissioner with the Government of India, where practically all the Government Horticulturists of various provinces were present, it was admitted that although budding was being tried in several parts of India, it could not as yet be called a commercial success.

Budding trials in the Punjab.

(a) **Budding in nursery.** For several years past, experiments on budding of mango seedlings in nursery have been in progress both at Lyallpur and Gurdaspur. Budding was done on one, two and three year old seedlings in the ground and on one year old seedling in pots in the months of April, May, June, July and August. In pots, two and three year old seedlings were not budded as their roots get pot bound and plants receive a severe setback and the bark of such plants does not

peel off readily and the success in budding is consequently very low in potted plants. Petioled and unpetioled bud wood, corresponding in age and thickness to that of the rootstock, was used. By petioled bud wood is meant that wood, of which the leaves were cut off close to the bud, at the time of budding, leaving a small projecting stub. By unpetioled budwood is meant that bud wood from which the leaves were cut off about 10 to 15 days before it was taken from the tree. This caused the petiole stub to abscise leaving a healed scar underneath which could not serve as a point of entry for any disease organism. Two methods of budding (i.e., shield and patch) were tried. The tying was done by four types of bandages, namely, "Sun fibre," raffia, cotton tape dipped in ordinary paraffin wax and cotton tape dipped in paraffin wax of high melting point (140-145°F). Raffia bandage was also covered with Plasticine to prevent desiccation from the point of insertion of bud. Plasticine (Harbutts Modelling Paste) is claimed to be clean, harm-

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less and practically indestructible modelling material which remains plastic for any length of time and does not convey infection. It does not droop, dry or shrink, is unaffected by heat, cold or water and will stand any climate. After the budding operation, some seedlings were immediately ringed 4 inches above the point of bud insertion, some were ringed after a fortnight at this point, some were immediately lopped off at this height and some were kept intact as control for comparison. The results of these investigations are summarised below:—

1. Budding was not successful with mango seedlings in pots. (2) The success of budding was very low with one year old mango seedlings in ground, it was 30—40 per cent. with two year old mango seedlings, and as high as 70 per cent. in case of 3 years old mango seedlings. (3) Best time for budding was found to be early spring. (4) Bud wood of the corresponding age and thickness to that of the rootstock gave the best results. (5) One year old bud wood gave the best results when budded over one year old shoots of mango seedlings of three years age. (6) The older the bud wood, the longer it took for the buds to sprout. (7) Unpetioled bud wood proved to be the best. (8) Shield budding was better than Patch budding. (9) Out of all the bandages, cotton tape dipped in paraffin wax of high melting point (140—145°F) proved to be most efficacious. (10) Ringing of the shoots fortnight after the budding operation, 4 inches above the point of bud insertion, gave the maximum 'take' of buds.

Three years old mango seedlings, which were successfully budded in the nursery at Lyallpur, were either potted or directly transplanted to the field to see their behaviour after transplanting. Out of 102 budded trees, only seven plants were successfully transplanted and the rest died as a result of injury caused to their tap roots. It was, therefore, apparent to us that the high percentage of success (70 per cent.) in mango budding, achieved by

us, was a matter of only mental satisfaction and an achievement more of academic interest than of any great practical utility. The transplanting of budded mango trees, from the nursery to the garden, presented a serious problem because of the tap root system of the plant and also because the plant was to be removed with a big earth ball which greatly increased freight charges and also the earth ball (Gachi) is likely to break on the way. It is probably this reason which has so far prevented commercial nurserymen, even in horticulturally advanced countries, to adopt budding of mangoes in the nursery as a business proposition.

(b) **Budding in Situ.** After we had been successful in the nursery in mango budding, an idea naturally occurred to us to get rid of the notion of production of budded mango plants as a nursery practice, and to try budding of mango seedlings *in Situ* in the field. This would avoid every complication as there will be no question of their **transplantation** from nursery to the garden which results in the death of plants due to the injury caused to their tap roots. All that the people will have to do would be to plant mango seedlings in the garden as regular plantation and then bud these over with choice varieties and let them remain there. The mango seedlings will grow quickly and will be converted into suitable varieties at a very low cost. These will get established within the shortest possible time.

So, this system of budding mango seedlings *in Situ* was tried by us firstly at Lyallpur and subsequently extended to other government farms and private gardens. In Spring 1940, 23 mango seedlings varying in age from 3 to 7 years, were budded *in Situ* in the Lyallpur experimental garden. Out of the 23 mango seedlings thus budded, 21 were successful and are growing splendidly at present. So far one, three year old, mango seedling budded *in Situ*, has put on about 55 ft. extension growth (i.e. main and secondary branches).

Another 5 year old budded mango tree, on which 10 buds were successful, has given a total extension growth of about 168 ft. in two years. In Spring 1942, about 400 mango seedlings, 3 to 5 year old, were budded in Situ at various places in the province and the results achieved are very encouraging in all places barring one or two private gardens where proper attention was not given. At Iftabad in Lyallpur District and at the Multan Agricultural farm where 75 plants were budded, more than 90 per cent. of the plants are successful.

It may be of interest to mention here that last year at Lyallpur we successfully topworked, by means of budding, three old mango seedling trees varying in age from ten to twenty-five years. During one year time, a 10 year old seedling has put on a total extension growth of about 150 ft.

The actual budding operations with the three year or older mango seedlings in Situ and top working of old seedling mango trees are briefly given below for the benefit of the readers:—

I. Establishing New Mango Plantations.

(A) **Raising of mango seedlings.** Select mango stones from vigorously growing seedling mango trees bearing heavy and regular crop every year. Stones should be free from disease. Sow the stones 30 ft. apart in the form of regular plantations, or along water channels, borders of field and road sides. At each place two stones should be sown to ensure the germination of at least one. The seedlings thus raised should be regularly watered and hoed. If desired and found more convenient, the seeds may be sown in the nursery and seedlings one year old, transplanted in permanent places.

(B) **Budding operation.** After about three years, the seedlings would have given two to three or even more shoots. In very rich soils, this much growth may be obtained even in two years. Bud these shoots with the exception of one, in the month

of April, by means of shield budding, the ordinary method of propagation followed in citrus. Select bud wood for budding from parent tree of desired variety. The bud wood should be round, healthy and equal in thickness and age to that of the shoots to be budded. The buds in the axil of the leaves should be prominent and should be as large as the head of an ordinary pin. In dry places, the desired bud wood is not generally available in sufficient quantity as the buds in the axil of leaves remain dormant. To get desirable buds, the following method is adopted:—

(C) **Preparation of bud wood:**—Select healthy and round bud wood, equal in age and thickness to the shoots of the stock to be budded. Cut off the immature portion of the shoots from which bud wood is desired to be taken. Clip off about half a dozen leaves immediately below the cut, leaving leaf petioles intact. After about 10—15 days, depending upon the vigour of the scion trees, the dormant buds in the axil of the lopped off leaves become prominent and the petioles also fall off. At this stage, bud wood should be removed for budding. After bud insertion, cotton tape dipped in paraffin wax of high melting point should be used as a bandage.

II. Top working old inferior seedling mango trees.

All the limbs, excepting one, of the old seedling mango trees are headed back to within a foot or so of the main trunk immediately after the danger of frost is over, i.e., February-March. One limb (sap drawer) is left to provide shade and to ensure the circulation of the sap until the new top has formed. The main trunk at the time of heading back should be shaded either by 'jantar' (*Sesbania egyp-tica*) hedge on the South western side of the tree or by wrapping old gunny bags till the new top is sufficiently formed to shade the trunk, otherwise sun burn is likely to occur to the exposed trunk of the tree which will cause cracking of the bark. The strongest shoots, out of those, that subsequently issue from the headed back

limbs, are budded in monsoon or in September-October with immature bud wood or in the beginning of the next spring in the same way as the three year old mango seedlings mentioned above. The successfully budded shoots are retained and all others, including the limb not headed back, are removed.

Instructions to be followed after the budding operation.

(1) The budded plants should be seen two weeks after the date of their budding and if the scion buds are green, the budded shoots should be ringed four inches above the point of bud insertion. The ring should be complete around the shoot and should be just an incision by means of an ordinary budding knife. Care should be taken not to allow any stock to sprout below the ring.

(2) Two weeks after the shoots are ringed, the scion buds should again be

seen and if they have sprouted or are still green, the budded shoots should be lopped off at the point where the ring was made. Stock sprouts should be regularly pinched off.

(3) After the scion buds have started growth and the scion shoots have attained a length of about six inches, these shoots should be loosely tied with the stump of the stock by means of a thread or twine so that the scion shoots are not blown away by strong winds. The tape used for budding should be untied at this stage. All the unbudded and unsuccessfully budded mango shoots of the seedling should be removed from the point of their origin and only scion shoots may be allowed to grow.

(4) During winter, the budded trees should be sheltered against cold.

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Readers of the Punjab Fruit Journal are informed that only a few copies of the illuminating and comprehensive Bulletin dealing with the Fruit Industry of Kashmir, published by the Punjab Fruit Development Board, are left in stock. This Bulletin is based on the observations made by the Fruit Specialist, Punjab, and the Assistant Fruit Specialist during their visit to Kashmir State.

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**THE PUNJAB FRUIT DEVELOPMENT BOARD,
LYALLPUR.**

Advantages of budding in Situ.

The advantages in this system of mango propagation are obvious. These are :—

1. No further necessity of enarching which is a tedious, time consuming, cumbersome and expensive method.
2. No fancy prices to be paid to nursery-men.
3. No expensive packing and heavy freight charges to be paid for bringing plants from distant nurseries.
4. No risk of the death of plants in transit.
5. No danger of plants dying after transplantation in their permanent places in the garden.
6. No danger of plants dying due to soil and climatic variations.
7. No danger of the roots being pot bound.
8. No danger of getting mis-shaped and unhealthy mango grafts from the nursery-men.
9. The plants produced are stronger due to better union, and are not only well shaped but also develop into good sized, healthy trees.
10. Much larger number of plants can be produced from a parent mango tree as a single shoot can give a good number of buds to produce so many plants.
11. Propagation of varieties of trees, even though existing in out of the way places or at a long distance, becomes a simple matter. It is far more economical for a grower to transport bud wood even from long distances than transporting heavy potted seedling plants to the parent tree for enarching and then bringing the enarched potted plants to his garden.

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12. Last but not the least advantage in this method is the reliability of varieties propagated. When a grower purchases grafts from nurseries, even the most reliable and honest nurserymen are liable to commit unintentional mistakes by supplying plants of wrong varieties. Numerous instances can be cited where people, having paid fancy prices for the grafts and heavy freight charges for getting them from long distances and bringing them into bearing stage at great expense, felt disappointed and disillusioned at the quality of the fruit because of unintentional mistake on the part of the nurserymen or deliberate cheating in supplying plants of wrong varieties. It will become a thing of the past when this scheme of budding mango seedlings *in situ* is taken up on a commercial scale and especially when the bud wood is removed and budding operations got done in one's own presence.

Commercial Exploitations :—

For the commercial exploitation of these findings, two alternatives are suggested :

1. Commercial nurserymen can undertake budding of mango seedlings *in situ* at -[4]- or so per plant successfully budded. While an honest nurseryman can make good profit by undertaking this work in private gardens on a commercial scale, the grower will have the satisfaction of getting his plantation stocked with genuine varieties at a low price and within a short period.

2. The second alternative is, that the Punjab Government should take up this work. People should be advised to sow mango seeds or plant seedlings 30 ft. apart in the form of regular plantations or along water channels, road sides, borders of field, etc. This can be done at a nominal cost only. These trees will attain good bud-dable size two to three years after sowing, depending upon soil, irrigation, care and also whether seedlings have been trans-

planted or seeds have been sown. Government can employ well-trained staff for budding work and make a reasonable charge—say—-[4]- or so per plant successfully budded over. It is certain that not even the poorest zamindar would grudge paying such a ridiculously small amount since the total cost of budding would come to only about Rs. 12[-] per acre, stocked with genuine varieties of mango, on which he has to incur at present hundreds of rupees. At the same time, Government will not be loser because a trained budder at Lyallpur, getting Re. 1[-] per day, can bud, on an average, 20—25 mango seedlings with 75 per cent. success.

As already mentioned elsewhere, we have been successful in budding both young and old mango seedlings. In fact, at Lyallpur one, ten year old, and two, 25 year old, mango seedlings have been successfully budded. So, it is possible that, in due course, the findings of these experiments may be utilized for converting lakhs of worthless trees to profitable varieties. But, for the present, this new method of budding *in situ*, can be exploited to establish thousands of commercial mango plantations containing lakhs of trees, and all this at a very little cost to the growers and at no expense to the Government. It is no exaggeration to say that by adopting this method, mango industry in the Punjab can be revolutionised and would come at par with other mango producing provinces in India. There is no reason why a big drive should not be made by the Government or through private enterprise to induce people to plant lakhs of mango seedling trees which Government or Punjab Fruit Development Board or some nurserymen of high standing should undertake to bud at a certain fixed rate.

So far the Fruit Section of the Punjab Agricultural Department has devoted its major attention to pushing up the cultivation of citrus fruits in the Punjab with very gratifying results. There has been immense increase in the area under citrus fruits and standard of gardening has also been improved with the result that citrus

fruits have been brought within the reach of even poor class people. Citrus squash industry, which was almost unknown in the province a few years back, has also received the greatest push and the Punjab is now leading all other provinces in this industry. The Department of Agriculture can now safely divert its attention to the extension of area under superior commercial varieties of mango in the Punjab. The Punjab, at present, imports fruit of grafted mango varieties to the extent of lakhs of rupees every year, and as the cost of the fruit is very high it is not within an easy reach of even middle class people and is the monopoly of only the rich

NOTE:—It may be mentioned that budding trials with mango have been conducted for many years past and will be continued in future also and their findings made available from time to time. The results achieved so far are, however, considered to be of sufficient importance and practical utility to warrant their publication even at this stage.

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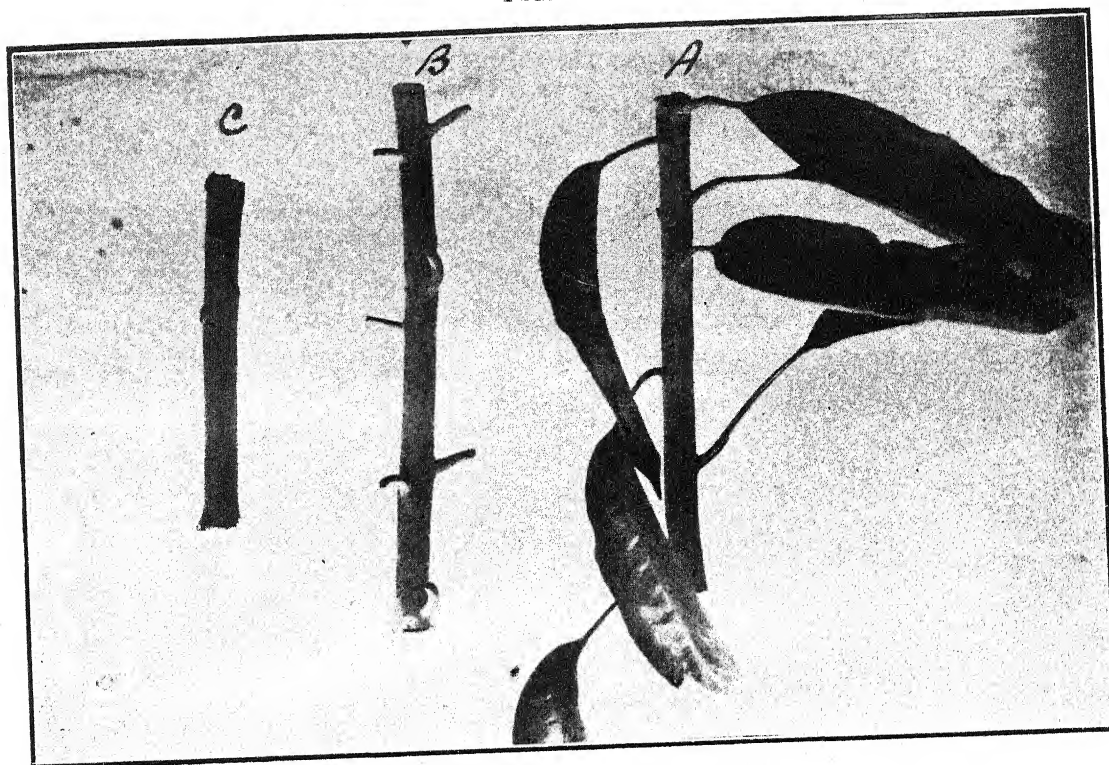
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FIG. I.

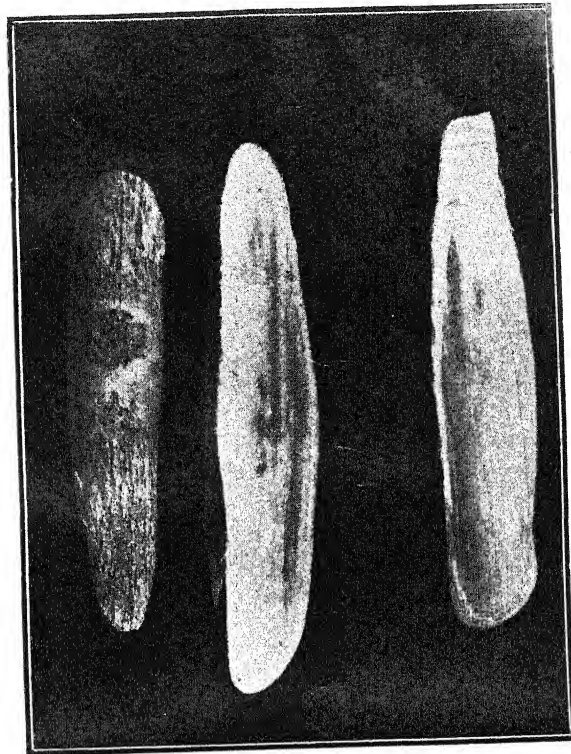


PREPARATION OF BUD WOOD.

Right to left :—

- (A) Shoot of which immature wood is lopped.
- (B) Same as A above and in addition leaves have been removed leaving leaf petioles intact.
- (C) Leaf petioles have fallen after 12 days leaving healed scar under-neath.

FIG. II.



DESIRABLE AND UNDESIRABLE BUDS.

Left to right :—

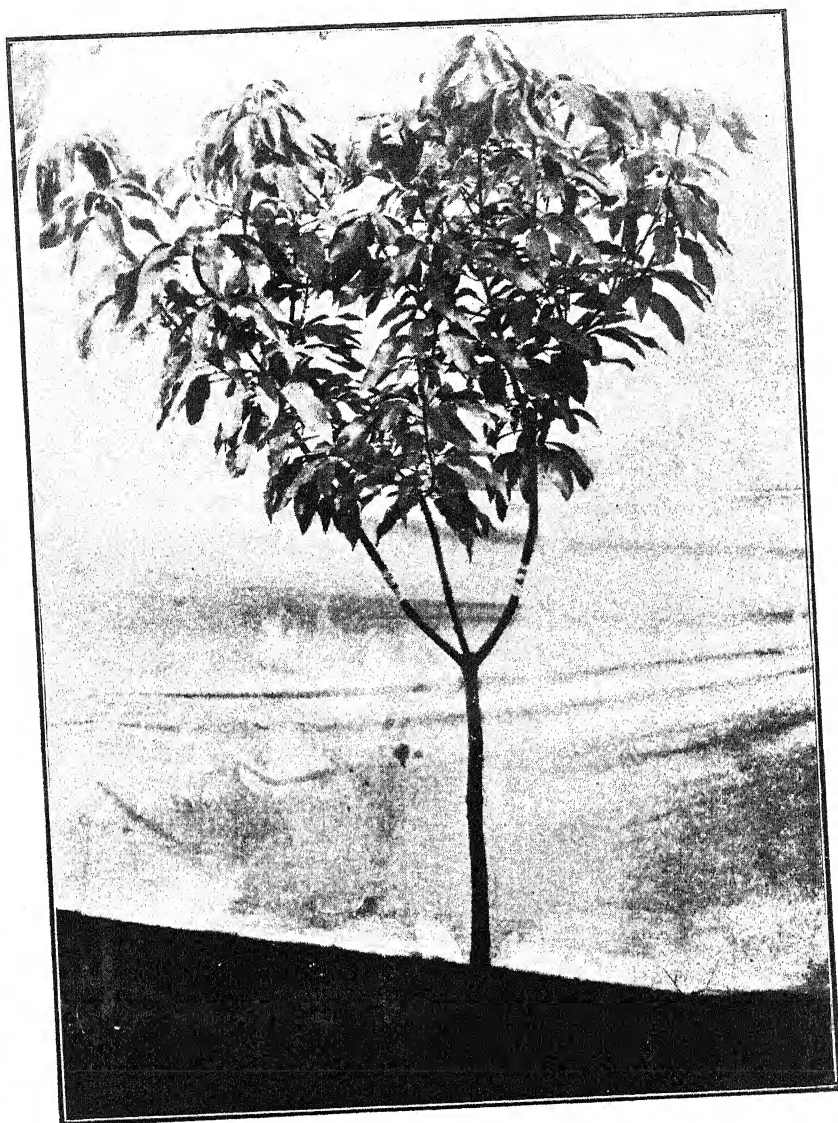
- (A) Upper side of the desirable bud. See the prominent bud above and a healed scar below.
- (B) Lower side of the desirable bud which shows both leaf and bud scars. Such buds unite readily and are most successful.
- (C) Lower side of the undesirable bud which shows only one scar (leaf scar). The bud scar is absent.

FIG. III.



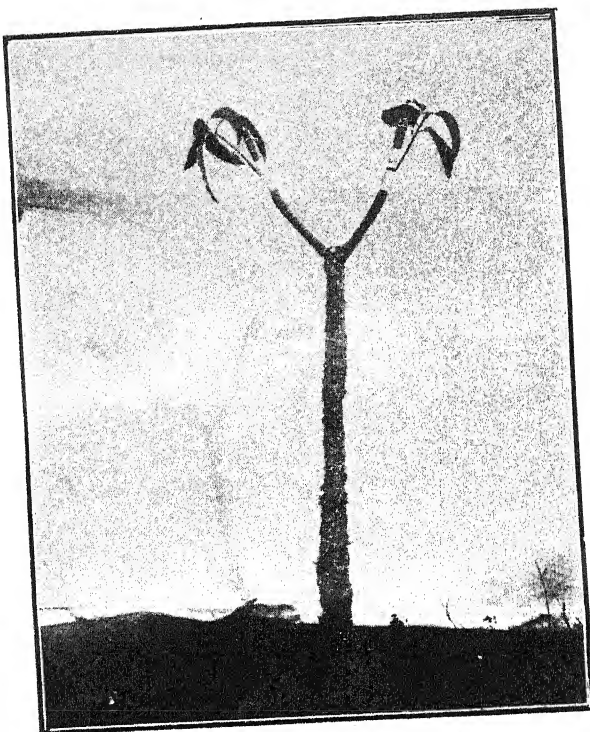
Typical three year old mango seedling fit for budding in *situ*. Note the three shoots it has developed.

FIG. IV.



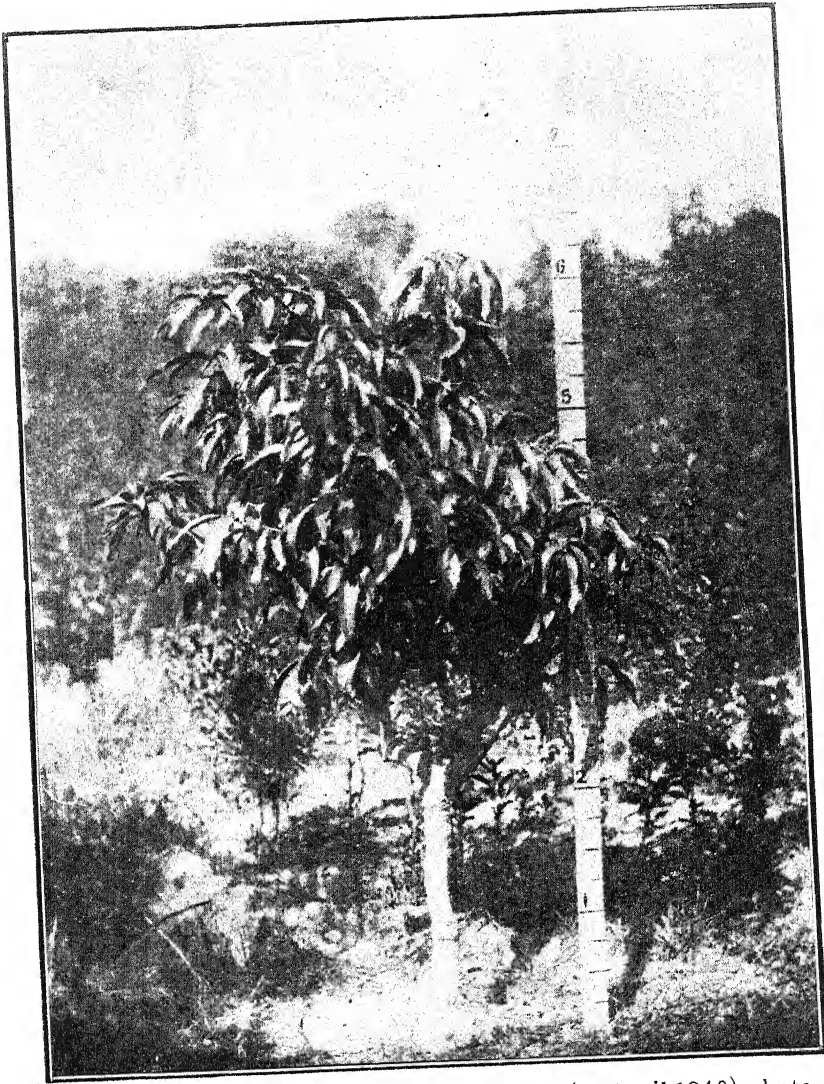
Same mango seedling as in Fig. III, two shoots of which have been budded. Third shoot has been left as such.

FIG. V.



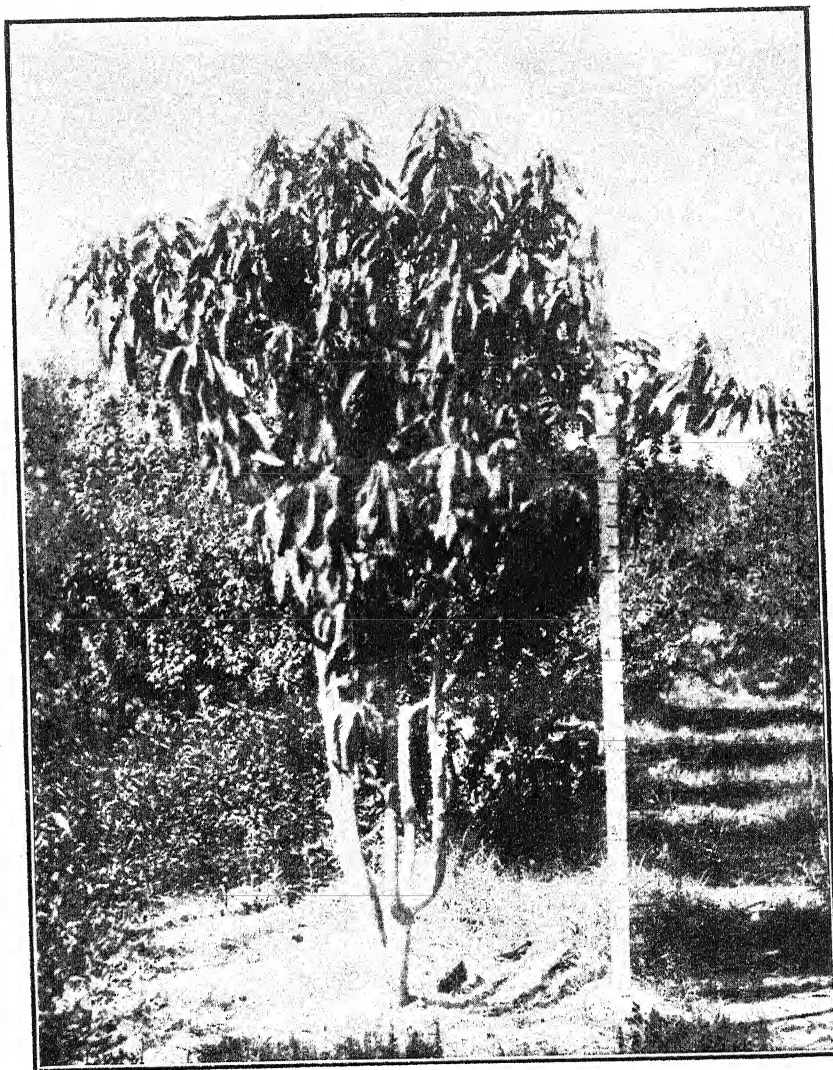
Same mango seedling as in Fig. IV, after the scion buds have sprouted. The third unbudded shoot has been removed at this stage and the stem has been wrapped with an old piece of gunny bag to protect it against sun-burn. Also see the scion shoots which have been loosely tied with the stubs of the stock to protect them from being blown away by strong winds.

FIG. VI.



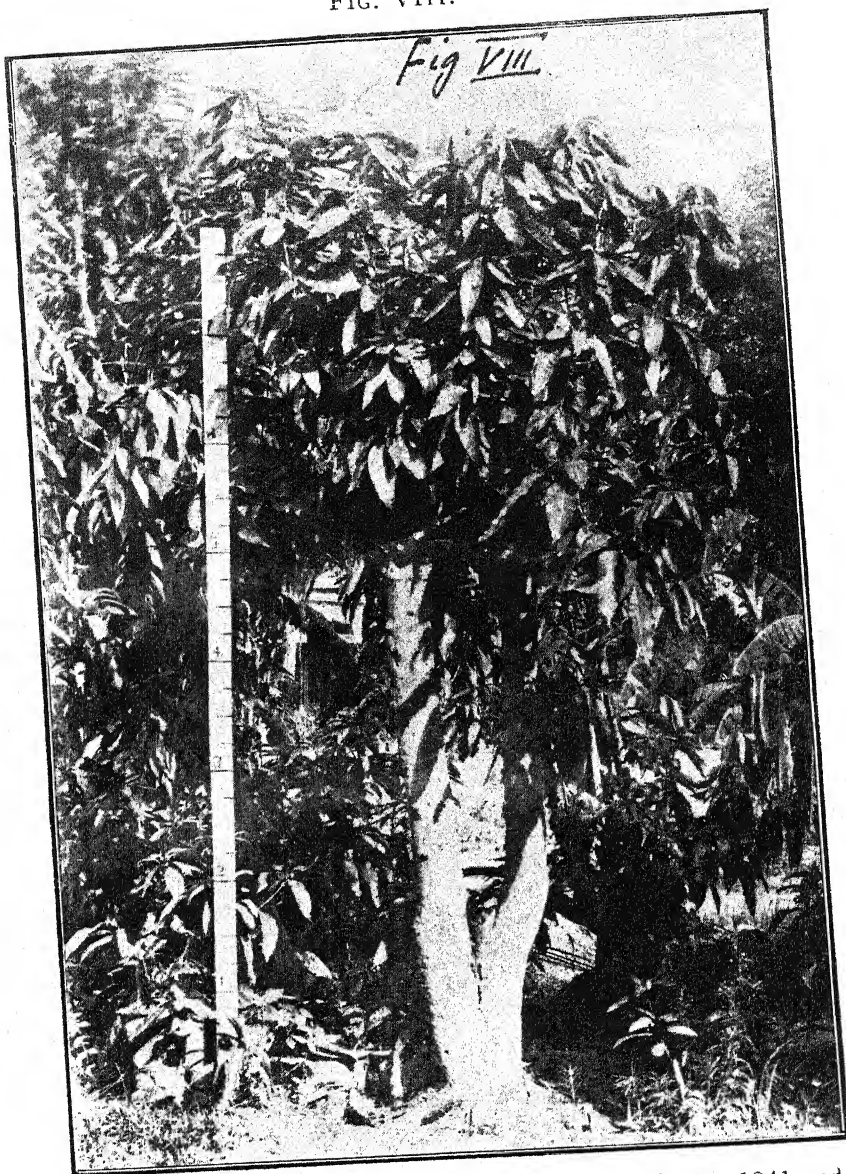
Three year old mango seedling budded in situ (in April 1940) photographed about two years after budding. See the ideal shape and growth of the tree.

FIG. VII.



Five year old mango seedling budded in situ (in April 1940) photographed about two years after budding. See the growth it has made during this period.

FIG. VIII.



Ten year old mango seedling headed back in Spring 1941 and the new shoots sent forth by the tree were budded in June, 1941. The photograph was taken one year after budding. See the amount of growth produced by the tree in one year. The wounds on the main limbs have completely healed over.

Farm Production of Sugar Cane Syrup

By

S. R. Swarup, B.Sc. (Agri.),
Assistant Industrial Planning Officer,
(Foodstuffs) Supply Department,
New Delhi.

Ex-Fruit Utilization and Marketing
Officer, U. P.

Owing to the improved types of sugarcane having been introduced in the United Provinces and the existence of a number of sugar factories, sugarcane cultivation has been on the increase during the past few years. Some areas which are far from the factories or where no transport facilities exist, find it difficult to market their produce profitably. It is for the benefit of such growers that this article is being written with a view to enable them to earn larger profits.

The production of sugarcane syrup has made much progress in the U.S.A., and it affords a very good opportunity for the small investor provided he is able to market his products successfully. For this, production of sugarcane of uniform quality is essential. The popularity of this syrup in the U.S.A., can be judged by the fact that in the year 1939, 24,909,000 gallons were produced and sold.

The harvesting of the sugarcane crop should progress with the mill work and no more cane than can be worked in a day being stripped and cut at one time. The sugarcane should be topped and stripped at a point which can best be determined by chewing the cane, the unripe, green top having relatively little sweetness. If the cane is not properly topped, the syrup is likely to be darker, not so clear, and of improper flavour.

The juice should be extracted by means of a power-driven mill or "Kolhu." One gallon of syrup is usually obtained from 6 to 7 gallons of juice; 5 to 6 gallons of wa-

ter being evaporated. The juice coming from the mill should first be heated, well strained and settled in tanks before it is run into the evaporator. Juice tanks or troughs should be built to slope a little, so that well-settled juice may be conveniently drawn off. The juice contains many impurities which are removed by the addition of chemicals such as milk of lime, carbonate of lime and decolorised carbon. The juice is best clarified by the addition of $1\frac{1}{2}$ to 2 lbs. of carbon to every 100 gallons of the juice and then filtered.

The clear juice should now be run into an open pan evaporator. The evaporator may be 12 ft. long, 3 ft. 6 in. wide and 10 inches deep built on a slope. Success in making syrup depends first on the thoroughness with which the juice is skimmed before it begins to boil rapidly. The juice should be evaporated to a uniform density which can best be determined by means of a Brix hydrometer. Syrup which tests 73° to 75° Brix at ordinary temperature with a hydrometer graduated at 20° C (68° F) boils at about 225° F at sea level. The syrup should be allowed to flow from the evaporator when this density is reached. Boiling should be done in two or three evaporators, to facilitate uniform boiling and prevent scorching. Scorched syrup acquires a red colour and a burnt flavour.

It has also been noticed that sugaring or crystallization of sugar takes place on cooling this high density syrup. This may be prevented by the addition of a small

quantity of yeast during the manufacture of the syrup. One ounce of pure yeast in powder or tablet form is dissolved in 250 c.c. or half pint of water out of which 50 c.c. are added to every 100 gallons of juice to prevent crystallization. The yeast extract converts a portion of the cane sugar into the two sugars—dextrose and levulose. These two sugars are just as sweet and wholesome as cane sugar, but they crystallise much less readily. The yeast extract should be added when the juice has a density of about 40° Brix. As this extract is destroyed at fairly high temperatures, the heated juice should be allowed to cool at 140° to 145°F before it is added. It should be well mixed in the syrup by thorough stirring. The juice should then be allowed to stand for at least 12 hours or overnight to enable the yeast extract to act. It should then be finished off by bringing the density to 73° to 75° Brix.

It has been noticed that, sometimes difficulty is experienced with an excessive amount of sediment. Syrup should, therefore, be allowed to remain in a settling tank overnight until all the suspended matter has settled down to the bottom. Clear syrup may then be drawn off from the top, reheated and canned or bottled.

Sugarcane syrup of the usual density should be canned to prevent fermentation. As the syrup has been thoroughly sterilized by boiling, it does not ferment if packed while hot in containers and sealed immediately. The cans or glass containers must be sealed air tight. Syrup from the evaporator, is strained through muslin and allowed to cool somewhat before sealing. For filling in small cans, the syrup should be at temperature of 190° F. for gallon cans, the syrup should be 180° F. and for barrels it should be cooled to at least 120° F.

It is sometimes worthwhile for all the sugar-cane syrup producers in one locality to co-operate in marketing their product.

A system of grading then becomes imperative. As a rule, buyers expect uniform quality. By fixing standards, it is possible to grade syrup as to colour, flavour, clarity and density. A system of grading makes it possible to market the syrup to better advantage.

Composition and Food Value.

Sugarcane syrup contains not more than 30 per cent of water and not more than 2.5 per cent ash, and should have a Brix Reading of 72° or higher. The food value of syrup consists essentially in its sugar content, the mineral matter and organic non-sugars also contributing fairly in this respect. In addition to this, sugarcane syrup is valued because of its characteristic flavour, which contributes to palatability and greater variety in the diet.

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Importance of Dormant or delayed Dormant Sprays on Deciduous Fruit Trees

By

S. R. Verma, M.Sc.,

Superintendent Hill Orchards,

Kandaghat, (Patiala State).

Deciduous trees shed their leaves in early winter and as such they expose hibernating insects on their leafless naked limbs to the direct and easy hits of dormant sprays. The effectiveness of the spray is greatly reduced when it is applied on foliated trees as the foliage acts as a hindrance and a cover. Besides, many of our insect pests are minute and inconspicuous and increase rapidly in numbers causing a considerable injury before we become aware of their presence behind the curtain of green leaves.

Doubtless, all deciduous trees and shrubs do not require dormant sprays; but the trees that have been seriously injured during the preceding active season by insects, will have to be sprayed during winters in order to destroy them in their wintering stage—be it eggs or otherwise. Pests that ordinarily pass their winters on bare trees are spider mite and aphid in egg form and scale insects. Dormant sprays, just before the new growth begins, are effective in killing aphid eggs that start hatching on or about the time the buds begin to swell. Another point in favour of this spray, at the time when buds begin to swell, is that sap is ascending the plants and it makes them less susceptible to spray injury on this account.

Most species of spider mites pass their winter in the egg stage on the small twigs around the buds, and in cracks and crevices of bark; and when they are abundant they may be found on the larger limbs or even on the trunks of trees.

These insects may be killed during the growing season, but to do a better job of destroying the eggs with sprays, there is no season more favourable than the one when the growth is due to start.

Scale insects in winter are found on twigs or under limbs. They do not move about much after they have once settled and have formed a scaly covering.

This hard scale like covering protects them against unfavourable wintry weather, against their natural enemies and even, to some extent, against spring frosts or sprays, which also tend to be obstructed by foliage.

Oil Sprays:—Oil made miscible with water is most effective for all kinds of the above-noted eggs, nymphs (newly hatched youngones) or adults found on fruit trees. Miscible oils are also good for ornamental plants or shrubs because they cause no injury when excess is used. Diesel oil emulsion as recommended by the Entomologist, Punjab for San Jose Scale, is perhaps the cheapest and the best.

Caution :—As this spray is intended to be used in higher altitudes and colder climates, a little caution is advised in the application of oil emulsions as dormant sprays. Never spray during the freezing weather. Spray at a time when there is no probability of the temperature falling down below freezing point within 24 hours of spray application. Freezing, before the oil dries out, causes serious injury to the buds.

Fruit Culture in Baluchistan

By

Kh. A. Haye, M.A., B.T. (Pb.),

M.R.A.S., (Lond.),

Sandeman Higher Secondary School

and Govt. College, Quetta (Baluchistan).

Baluchistan is one of the most important fruit-growing tracts of India where fruit-growing has immense possibilities of expansion and development in future. The soil is fertile. It is a fine loess, though due to its close texture, becomes compact under the influence of irrigation and makes it considerably difficult for fruit-growers to keep the sub-soil well aerated.

The climatic conditions in the upland valleys of the Province, which generally consist of tablelands and dry river-beds at an elevation of 3,000 to 6,000 ft. above sea level, are particularly suitable for the production of deciduous fruits of different kinds, each having innumerable varieties which are extensively grown both for local consumption and export to markets outside the province. The climate of Quetta may be regarded, more or less, a representative of the fruit-growing tracts of the Province. It is very dry with an annual rainfall, including snowfall, ranging between 8 and 12 inches. The maximum summer temperature seldom approaches 100°F, whereas the minimum winter temperature often comes down to 12°F and makes winter notoriously rigorous.

The main fruit-growing tracts are the districts of Quetta-Pishin, Loralai, Zhob and Harnai Sub-division of the Sibi District. The fruits chiefly grown are grapes, peaches, apricots, almonds, apples, pomegranates and melons.

I. VARIETIES OF DIFFERENT KINDS OF FRUITS GROWN.

Grapes. Nowhere in India is the climate so eminently suited for grape-growing as is that of the uplands of Baluchistan, where the elevation ranges between 4,500 and 6,000 ft. The total area under grape cultivation in Baluchistan is 2420 acres and the average yield per vine ranges between 14 to 20 lbs. ("Grape-growing in Baluchistan" by Mustafa and Asghar Ginai, Imperial Council of Agricultural Research, Miscellaneous Bulletin, No. 40, 1940). The grape season lasts from July to about the end of October. Grapes are grown in trenches and thus get protection from the sun and wind. Innumerable varieties of grape are grown there of which Sahibi, Haitha, Spin-Kishmish and Tor are grown for commercial purposes and are briefly described below. It may be mentioned that Haitha and Spin-Kishmish are generally exported to markets in India.

Sahibi is longish, light red in colour and of soft skin. It is grown in Gulistan and certain parts of the Pishin Tahsil and the Quetta sub-division.

Haitha is a large, oval-shaped sweet grape with hard skin. Its quality improves in storage after picking.

Kishmish is of two grades, spin-kishmish and sra-kishmish. - It is delicate, soft-skinned and small-sized. **Kishmish, Haitha and Shandao Khani** grapes have been successfully dried under the Canning and Fruit Preservation Research Scheme for Baluchistan.

Tor is oval-shaped, dark-coloured, and is fairly sweet.

A large number of varieties of grape have recently been imported from California and are being tried at the Fruit Experiment Station, Quetta.

Peaches. A large number of varieties of peach (*shaftalu*) are grown in Baluchistan, but unlike grapes, no specific names are allotted to them. They are generally classed according to the time when they ripen. The early varieties are known as **Garma**, the mid-season ones **Sardai** and those which ripen late in the season **Mannai**. From 1913 to 1918 the Howards made a large collection of local varieties and introduced foreign varieties as well. The Agricultural Department has, after a critical study of all the available varieties, selected, identified, named and horticulturally described 16 distinct varieties in Baluchistan.* The area under peach cultivation is very small, and is confined mainly to the Quetta-Pishin district.

Apricots. Apricot (*zardalu*) is a common fruit of the Quetta-Pishin district. The best kinds are available in Gulistan, Killa Abdullah, Karez Inayatullah and Kirani. The fruit ripens in June and is at its best in July. Much of it is dried and preserved, and finds a ready market in winter both in and outside Baluchistan.

Almonds. There are very few places in India where almonds can be successfully grown, and one of those places is the uplands of Baluchistan where wild almonds are also found growing in abundance. Apart from its commercial value, almond is grown in almost every orchard in Baluchistan for ornamental purposes. It blossoms profusely in March and April, making the place gay with its whitish, pink and pale rose-coloured flowers. Almonds are successfully grown in the district of Loralai which has the most suitable climate for their cultivation. In Baluchistan three kinds of almond, viz., sweet-hard-shelled, bitter-hard-shelled and paper-shelled or *romali* are grown. But there is one limit-

ing factor in the production of almonds on a commercial scale, and that is the occurrence of early frost in most parts, particularly in the Quetta-Pishin district.

Apples. Apples are successfully grown in almost all the fruit-growing tracts of the Province. There are two well-known varieties—the **Kulu** and the **Kandhari** apples. But apple cultivation has received a severe set back due to the appearance of the notorious Codling moth which damages about 80% of the crop every year. As a result thereof, some very fine and valuable apple-orchards have of late been cut down, as the crop produced was found to be of very inferior type, being mostly infested. The Agricultural Department is, however, trying to control the pest as its eradication is of prime importance in the development of apple fruit industry.

Pomegranates. This fruit is grown on a large scale in the Loralai district though a small area of the same is also grown in the Pishin sub-division of the Quetta Pishin district. The varieties of pomegranates so far recognized are the **Kandhari**, **Jalari**, **Mitha** and **Seedless**. These are mainly exported to Sindh and the Punjab.

Melons. Melons are locally known as **Palezat** and have two varieties—**garma** (*kharbuza*) or summer melon and **sarda** or autumn melon. The **garma** is extremely sweet. The **sarda** is the well known musk-melon and can be kept for several months without the risk of its spoilage. Some fifteen varieties of **sarda** have been identified in Baluchistan. Melon cultivation is mainly carried on in the Pishin sub-division, but it has recently received a set back on account of constant attacks of the notorious Baluchistan melon fly which damages more than 90% of the fruit every year.

Besides, the fruits enumerated above, Baluchistan produces plums (*alucha*),

*Mustafa "(Peach-growing in Baluchistan": Indian Farming, Vol. II, No. 3, March, 1941, Pp. 124—26.

damsons (alubukhara) and mulberries of more than one variety; quinces and pears are grown in abundance throughout the Province. Pears produced in Fort Sandeman are considered to be the best in Baluchistan.

II. DEVELOPMENT SCHEMES.

In order to give an impetus to grape-growing and almonds cultivation in Baluchistan, three developmental schemes have so far been put into operation by the Department. The object aimed at is to provide the people with striking examples of what they can do when working under expert technical direction and guidance.

(1) **Mallezai Vineyard Scheme:** About one hundred acres of land at Mallezai near Pishin was brought in 1937 under grape cultivation. Grapes are planted in trenches according to local methods. More than 66% of over 26,000 vines have already established themselves (Baluchistan Administration Report, 1939-40, P. 10).

(2) **Kurtat Khurd Grove Scheme:**—Kurtat Khurd is some 11 miles from Loralai and is eminently suited for almond cultivation. The area of the estate is 50 acres, and it is wholly planted with almonds. There are 7,000 trees which, it is hoped, will give their first crop in 1942-43 (Baluchistan Administration Report, 1939-40, P. 10).

(3) **Duki Almond Grove Scheme:**—Duki is a Tahsil of the Loralai district. The area brought under experiment is 25 acres. The work began there in 1940.

Under above schemes, the owner of the land provides labour and cattle power, and the Government give him monetary help in the form of 'Taccavi' loans. The Agricultural Department furnishes working plans, expert advice and assistance, and manages the orchards in co-operation with the owner of the land. When the orchards will come into bearing, the 'Taccavi' loan will be paid back from the income of the estate. It is hoped that within a period of ten years the full amount of the loan will have been paid back to the Government and a portion of it will go to the owner of the land in the form of income. At the end of that period the orchards will be handed over to the owners who, by that time, will have been sufficiently trained to take charge of the orchards and run them efficiently. These schemes are unique of their kind in India.

III. Nurseries

The Agricultural Department is raising nurseries on a large scale and the plants are invariably distributed free to Zamindars through the Political Agents of the various districts. The best varieties are selected and propagated on a large scale.

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While replying please mention the Punjab Fruit Journal.

A year with Kashmir Bees on the Punjab Plains

By

R. Mitchel, Indian Mildura

Fruit Farms Ltd.,

Renala Khurd, Distt. Montgomery.

You may have heard the popular Mad-rigal which is often sung by harmony singers on the wireless about "ten green bottles hanging on the wall" and how if one by one they should accidentally fall there will be one less hanging on the wall. Such is my first year's experience with my Kashmir bees and it is an experience that all beginners must go through unless they have learned this complicated subject so well that they can immediately guard against all the dangers and pitfalls that beset a colony of *Apis Indica* during the heat of the Punjab Summer when there is a lack of flora and the bees cannot work due to the heat.

If I had not learned the first and probably the most important lesson, my troubles would have started much earlier and probably lasted longer. For a colony of hill bees to stand the dangers of the four hot months it must start strong just the same as a human being. If a person is unwell at the beginning of the summer months, he or she is no likely to get strong and work well through the heat and is liable to get fever during the malarial periods. Bees don't get malaria as far as we know but they are, in a weak state, far more subject to the many troubles common to bees. All weak colonies must be united into one or several strong colonies as soon as the main honey flow is over. I had eleven colonies at the end of March but during April these were reduced to six by uniting.

The next part of what I consider lesson No. 1, is the matter of stores. A. I. Root, in his book "A B C and X Y Z of Bee keeping", dwells at great length on the matter of stores for the winter. What Mr. Root advises for the winter should be followed as near as possible in the Punjab plains in the summer. Mr. Root sets the very high figure of stores to be reserved for bees during the closed season. One complete super of 10 frames of honey over the broad chamber is desirable.

I have read some very interesting records of honey production in a season and have often wondered if this or that record breaker left anything like the amount of stores that Mr. Root recommends. An expert may be able to feed the bees so carefully that they are not upset. However, I do think a good example should be set to new recruits to the industry. A very expert bee-keeper once told me that the first consideration of an apiarist should be bee husbandry. He is a true lover of bees as every bee-keeper should be and considers that his bees are his pets and should have the first consideration. If they do produce enough surplus honey for him to take, he is grateful for it but he does not demand it.

To continue with my own experience, I found that after the end of the main citrus honey flow at the end of March, there is quite a strong clover flow which lasts right through April which is supported by

Seesham and that very heavy flowering jungle bush called "Kareer" which also flowers again at the end of August and early September. If, however, the bee-keeper can keep his bees near a good lucerne crop they could possibly be kept working up to June or later.

Many have succeeded in keeping bees through the Punjab summer, but many more have failed including myself, in their first attempt. My own failure is mainly due to neglect. A depleted staff and the present difficult times we are experiencing, have left me very little spare time to attend to my new hobby this summer. Unfortunately, the man I had trained in Kashmir proved most unreliable when left too much on his own and left me when it got hot. I managed to carry on with a very green youth and the occasional assistance of my friend Mr. Kaul who is a true friend of bees and bee keepers. Unfortunately, before Mr. Kaul first came down in August at my urgent call, I had made many errors in my ignorance by which I lost my three strongest colonies. The place where I kept my bees although a perfectly shaded nursery, proved also a great breeding place for wax moth and even Mr. Kaul could not save two more of my hives which were heavily attacked. Now in the beginning of September I have only one hive left.

I merely mention my troubles to show others that without constant, careful and experienced attention there is little hope of keeping bees successfully through a Punjab summer. At the same time it is very doubtful if bee-keeping can be entirely successful commercially in the Punjab unless all or most of the colonies can be moved up to the hills in May and returned not earlier than the middle of September, when there is a mild honey flow from *Toria* supported by *Keekar* (*Acacia Arabica*). The rich nectar bearing Loquat will keep the bees busy in October and this is followed by gram and sarson which will keep them busy until the short frosty spell of

January. If the colonies are strong before this frost with a full chamber of brood and the hives are lightly covered during the frosty period, a rich honey harvest should be got from the citrus flowering.

There are many lovers of bees in the Punjab whose work gives them little time to take holidays in the hills. Many have succeeded in keeping their bees successfully through the heat and dangers of the Punjab summer.

Although as I said before, it is unlikely that commercial bee-keeping will be successful without migrating bees to the hills, there is no reason why a few hives should not be kept to decorate the garden and act as a pleasant diversion to the work and the heat of the plains besides providing honey for the table.

IMPORTANT NOTE



**The Chief Editor does not
hold himself responsible
for the views expressed
in the articles published
by various contributors
in this Journal.**

Utilization of Fruits in India

By

Birendra Narain Singh, M.Sc.,

Offg. Fruit Utilization Inspector,

U. P., Lucknow.

India possesses such a wide range of climate and soil that almost all the fruits grown in the temperate the sub-tropical and the tropical zones, can be grown here, and many of these fruits grow so abundantly that huge quantities of these go to waste every year. The problem of proper utilization of this excess, which is of vital importance to the development of the fruit industry in this country, has unfortunately not received any great attention from chemists or industrialists here. Although some systematic research on the preservation of fruits and vegetables in India has been in progress at the fruit products Laboratories, Lyallpur, yet the field of research in this line is so vast and the literature on the subject so scanty that an extensive and systematic study of this problem is urgently needed.

Canning of mangoes, litchies, peas, grapes, tomatoes can be undertaken. Green peas, cabbages, potatoes, Lady's finger and various other green vegetables can be dried. The wood apple, guava, Karaunda, roselle, etc, have been found to yield good quality jellies; orange, lemon and grapefruit can be converted into good marmalade. Jams can be prepared from apple, pear, mango and papaya. Falsa (*Grewia asiatica*), Jammun (*Engenia Jambolana*) can be preserved in the form of fruit syrups and juices. As a matter of fact, all the Indian fruits can be converted successfully into some form of preserve. Some of these products are, no doubt, being manufactured on a commercial scale in our country, but there are still varieties of fruits which have not been tackled for large-scale pro-

duction. Due to military demands, a few new concerns have, however, sprung up but these, by no means, can meet the present demand of fruit products of various kinds, the imports of which are practically at stand still due to the present war-conditions.

Let us examine the fruit industry of other countries where people have made their fortunes out of fruit cultivation. The Hawaiian Islands, California, and the Malay Peninsula are instances of this. Preservation of fruits and vegetables is their chief industry. Before the present war, these countries exported huge quantities of fresh and preserved fruits to all parts of the world every year. The export value of Malayan pine apples was about a crore and a half of rupees. During the last few years, almost all the sixteen concerns in Malay, rebuilt their factories according to modern designs fitted with up-to-date machinery, the average productive capacity of a factory being about a lac of tins of canned pine apples per day. Malaya was the second largest producer of canned pine-apples, Hawaii taking the premier position, its export value amounted to about twenty crores of rupees. The growing and canning of pineapples increased to such an extent in the Hawaiian Islands, that in the course of a few years, the annual tonnage had grown from a few hundred to over two lacs of tons of this delicious fruit. Nearly 1500 workers were employed in each of the larger plants. In summer, hundreds of school boys and girls worked in these huge factories to earn their school fees. Trades

were usually under the government contract and only the best fruits could be marketed. Besides giving subsidies to the fruit utilization factories, the government imparted education and training to the growers in fruit culture and preservation and furthermore preservation of fruits and vegetables, had been included in the curriculum of subjects meant for studies in schools and colleges. On the contrary, the state of affairs with regard to proper utilization of fruits and vegetables in our country, presents a totally different picture. During the season, when the fruit is in plenty, one can witness tons of fruits of all kinds lying in heaps on the road side or in front of a shabby orchard and thus totally unprotected from dust and sun. Then there are the 'murrabawalas' who preserve a small fraction of fruits in earthen pots by the old indigenous methods, their premises humming with flies and wasps. Whenever a customer comes, they put their hands straight into the jars and retail their unwholesome products in an unhygienic manner. All these crude methods of handling and utilization of fruits have been responsible for the heavy import of both fresh and preserved fruits in our country.

Besides, there is also much scope for Indian specialities in the foreign market, in view of the fact that they are much appreciated in western countries. There is a growing taste for such products in the East as well. Squashes and juices of all kinds, jams, jellies and marmalades have already become fairly popular in India.

Fruit preserving and utilization factories can be started on modern lines with a capital of sixty thousand rupees or more. These factories would be capable of canning and bottling commodities worth over two lacs of rupees per year, yielding a net profit of about 15% on the goods sold. The establishment of several such factories all over India would stop the wastage of huge quantities of surplus fruits and drainage of enormous wealth to foreign countries. Besides, it would open a new industry for Indian capital, utilizing sugar,

tin cans, glass bottles and other accessories produced by Indian factories. It would increase the production of fruits by improved methods, and solve the problem of marketing fruits and vegetables, giving relief to cultivators and, incidentally, would solve to some extent the problem of unemployment. In these days of emergency, small manufacturers are also earning a good deal of profit, but in normal times small production increases the cost and hence they cannot compete with the foreign products, thus the necessity of establishing this industry on a much larger scale can be fully realised. The success of such enterprises will largely depend on the support given by the government. It is a matter of satisfaction that both the central and the local governments have accepted some of the suggestions of the Royal Commission Agriculture, and have accordingly inaugurated the Central Marketing Board and made provision for cold storage facilities. The Imperial Council of Agricultural Research is taking keen interest in the utilization of fruits, and have occasionally financed such schemes. The Director of Agriculture and the Provincial Marketing Officer, U. P. have aroused enthusiasm in the people of this province for fruit growing and utilization through the fruit Development Board and have also organised fruit preservation classes at various places. They have also financed such institutions and provided facilities to fruit utilization concerns.

Despite all this, much remains to be accomplished for the development of this industry in general, and the systematic chemical study of fruit preservation in particular, to meet the requirements of the home market and to successfully compete with the markets abroad. The establishment of government Fruit Research Stations in every province is of great importance for this purpose. Moreover, except for the Punjab and Bombay pro-

vinces, no systematic investigation in this field is being undertaken. Will the other provincial governments pay immediate attention to this problem of increasing importance during these days of war, when import of fruit products from foreign countries has altogether ceased? There is a great demand for such products in the market, besides huge military demands.

It would be better if systematic investigations on these lines are started with mutual co-operation of each of the provinces so as to avoid duplication and save time. The experimental results thus obtained should be immediately released for the benefit of the manufacturers and the public.

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PUNJAB FRUIT JOURNAL, LYALLPUR.

Citrus Aleurodidae (White Flies of citrus) in the Punjab and their control

By

Abdul Wahid Khan,

Entomological Section,

Lyallpur.

Very little was known before our investigation of the citrus White Flies in the Punjab and even the economic importance of these insects was not fully appreciated in our country simply because the damage caused to the host is not conspicuously visible. The attacked trees remain healthy-looking and there is no spotting, curling or withering of the shoots. The only sign of the Whitefly infestation is the development of black mould upon the leaves. As a result of our investigation, we have discovered seven different species of this family of insects and out of these five are highly dangerous to citrus orchards in the Punjab. These species are generally confused together and on account of their excreting "honey dew" these are locally named as Tela. The mode of recognition or identification, of the five most important species is given below.

1. The first and the most important species of White Flies is scientifically known as *Dialeurodes citri* Ashmead. The adults are small, pale yellow bodied with white opaque, immaculate mealy wings usually sitting on the lower side of fresh green leaves. The size of the female is about one and a half millimetre 1/17 inch. and the male is slightly smaller than the female. The eggs are very minute oval, pale, stalked and laid on the lower surface of the leaves. The nymphs and puparia are pale yellow, flattened bodied adhering to the lower surface of the leaves.

2. The second species is scientifically known as *Dialeurodes elongata* Dozier. The adults are similar to the first species but more yellowish in colour. The eggs are similar but the younger stages can be very easily recognised by their elongate shape.

3. The third species is *Aleurolobus citrifoli* Corb. The adults are similar to the above species but can easily be distinguished from their greatly smaller size. The eggs are very minute. The younger stages (nymphs) are pale with a characteristic median longitudinal brown area. The puparia are dark brown to deep black and somewhat rhomboid in appearance.

4. The fourth species is scientifically known as *Aleurocanthus husaini* Corb and may be called as the black Spiny fly. The adults are yellowish orange bodied with slaty macculated wings. Their feelers, front-part of head and legs are pale yellow. The eggs are minute reniform elliptical, stalked and with hexagonal markings on the surface. These are arranged on the leaves in a spiral of one whorl only. The nymphs and puparia are black with sharp spines on their body and rounded teeth on their margins.

5. The fifth species is scientifically known as *Aleurocanthus woglumi* Ashby. The adults are similar to those of the fourth species but differ in their larger size and macculation of the wings. Eggs

are laid in spirals of three whorls. Puparia are jet black, spiny and much larger in size than those of the fourth species.

The mode of life of these species being almost similar, the bionomics of *Dialeurodes citri* only is given as below.

Life-history of *Dialeurodes citri* :—The female lays eggs singly but irregularly scattered on the lower surface of fresh leaves. One female can lay about 200 eggs in its life-time. The eggs are laid by the first brood of adults in the months of March-April and by the 2nd brood in August to October.

The eggs hatch out within 7 to 14 days. The nymphs on hatching crawl about on the surface of the leaf usually for about 24 hours and later fix themselves to a suitable spot for life. They are invariably attached to the lower surface of the leaves but they are quite inconspicuous on account of their small size and transparent body. They suck sap and excrete "honey dew" the droplets of which are ejected from their anal opening scientifically called as vasiform orifice. To this sweet liquid, ants are attracted in large numbers and the infested plant may be easily recognised by the presence of ants. Later on, fungus grows on this sugary liquid and the leaves are covered with black soot-like mould. There are three nymphal stages and one pupal stage. The nymphal stage occupies 25 to 71 days, depending upon the reason, and the pupal stage 114 to 159 days. The total life-cycle, from the laying of the egg to the emerging out of the adult, occupies 178 to 205 days. The adults are very short-lived and live from 2 to 8 days.

Food-plants :—The citrus White-Flies have been collected from all the varieties of citrus but they are most common on orange and malta plants.

Distribution:—The citrus White-Flies are widely distributed in this province and have been recorded from almost all the various districts. The black spiny flies are especially abundant in the Central and the South Eastern districts.

Damage :—The citrus White-Flies take a heavy toll of plant-sap and lower the vitality of the trees. Heavily infested trees look blackish in appearance on account of the sooty mould. They produce scanty blossom and what little fruit is produced is generally poor in quality.

1. Preventive measures :—It has been observed that the severest attack of White-Flies appears in the gardens where the trees have been planted very close. Trees placed well apart and receiving sufficient sun and air, are much less attacked. It is therefore, advisable that the trees should be planted at proper distances and they should not be over-crowded.

Citrus hedges act as a source of infection and should be discouraged.

2. Remedial measures :—Spraying with rosin compound mixed with water (1 : 2½ to 3) or rosin soap dissolved in water (7ch. of soap in 20 seers of water) has proved most effective and economical. Spraying should be conducted during the winter months. Spraying with a light dilution of Rosin compound (1 : 5) during September to kill ovipositing adults and nymphs is also beneficial. The cost of spraying of an average-sized tree is about one to two annas.

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Horticultural Abstracts

Compiled by

Musahib-ud-Din, B.Sc. (Agri.),

Fruit Section, Lyallpur.

1. SIBERIAN CRAB APPLES AS ROOT-STOCK : By Bryden, J.D.

"Trees of Delicious, Jonathan, Granny Smith and Democrat on Siberian crab (*Pyrus malus baccata*) planted in the Bathurst Orchard stock trials in 1932, have grown more strongly than the same varieties on the Northern Spy in the same trial. Trees on this stock show extreme drought resistance especially Jonathan. The stock has a vigorous and extensive root system."

(Agric. Gaz. N.S.W., 1942, 52:480).

2. COMPOST : By Penzhorn, K.E.W.

"The following method has been found both successful and economic in irrigated areas in S. Africa. Wheat straw is soaked for 2-3 days in a hole filled with water and subsequently worked into heaps, 6 ft. wide. On each one foot layer of straw is placed a 3-inch layer of kraal manure, or instead 2:2:1 mixture of ammonium sulphate, agricultural lime and superphosphate respectively, at the approximate rate of 120 lbs. per ton of dry material and is worked into the wet material with a pitchfork. The finished heap is 6 ft. high. The heap is not again watered or turned and is ready for use in about two months."

(Horticultural Abstracts, March, 1942).

3. THE CO-OPERATIVE BUD SELECTION SOCIETY, Ltd.

"For some years it has been recognised that in most citrus groves there are trees that rarely produce sufficient fruits to be payable, whilst other trees are more constant producers of good quality and payable crops, so that with a view to enabling nurserymen to supply trees of the most productive and remunerative standards to planters, the above Society was formed under the aegis of the Department of Agriculture, and consist of representative fruit growers and nurserymen. The Society does not and cannot make profits, but merely exists to improve the fruit-growing industry by making available for budding selected buds from special trees of the best type of quality fruit and of reputed good bearing habit only. Trees from such buds should undoubtedly be more profitable and appeal to all progressive orchardists.

The Co-operative Bud Selection Society, Ltd., supplied the following selected buds to nurserymen during the 1941 budding season, trees from which should be available for planting during the 1942 season :—

	Washing- ton Navel.	Valencia Late.	Marsh Grape- fruit.	Eureka Lemon.	Lisbon Lemon.	Emperor Mandarin.	Total
Adamson, T.....	4,000	4,000	...	2,000	...	...	10,000
Cambourn, H.....	3,500	5,000	...	3,000	...	...	11,500
Catt, F. D.....	3,000	3,000	...	3,000	1,000	...	10,000
Eyles, A. T.....	5,000	5,000	1,000	2,000	...	...	13,000
Ferguson, E. H.....	1,000	1,500	...	500	...	...	3,000
Ferguson, F., & Son.....	2,500	2,500	...	...	...	...	5,000
McKee, Geo.....	1,500	1,000	...	1,000	1,000	...	4,500
Rosen, L. P., & Son.....	10,000	15,000	2,000	5,000	1,000	800	33,800
Smith, W.....	...	...	...	2,000	...	...	2,000
Spurway, F. E., & Son.....	3,500	5,000	750	500	250	...	10,000
Swane Bros.....	5,000	2,000	1,000	1,000	1,000	800	10,800
	39,000	44,000	4,750	10,000	4,250	1,600	113,600

(The Agric. Gaz. of N. S. W., July 1, 1942).

4. A NEW METHOD OF PREPARATION OF BRITISH MARMALADE: By Robert C. Evons.

"As one official puts it, "An Englishman must have his marmalade for breakfast or he is in no condition to be bombed." This may be a slight exaggeration, but the lack of customary foods undoubtedly hurts morale. Like coffee, here, marmalade is a staple in Great Britain and the British Government has tried to maintain ample supplies even under wartime conditions.

It has proved to be something of a job, and one big difficulty has been the British liking for bitter marmalade. Prior to the outbreak of war, this flavour was obtained by making the product from bitter oranges, grown largely in Spain. Great Britain has continued to import some Spanish oranges, but the supply has been far short of requirements.

So it looked for a time as if there were only two alternatives—no marmalade at all or, in British opinion, an unsatisfactory product from the American sweet oranges. Then one expert began to do some thinking: "The United States produces a lot of oranges—sweet oranges that the British do not consider suitable for marmalade. But that country also produces grapefruit, the peel of which is very bitter. Perhaps, by combining the two fruits in some man-

ner, it might be possible to turn out a fair marmalade—good enough for the duration anyway." This scheme was tried experimentally—and it worked.

American mass production methods are largely responsible for the good showing being made in filling the British order. Like the airplane factories, the pulp processing plants have a precise way of carrying out each operation. Good grove run fruit, purchased by the government, is scalded to loosen the peel and then run through a battery of revolving brushes to remove dirt and scale. The cleaned fruit is peeled while it moves along on belts, the unsuitable portions of the peel being discarded. The good peel is cooked and sliced.

The water in which the peel is cooked contains certain pectin and flavour elements, so it is strained and pumped into a large tank and used for cooking the peeled fruit. Live steam is used for heat and after the fruit is thoroughly disintegrated, usually in about 20 minutes, it is run through a machine that removes all seeds, and heavy "rag."

The two products—the cooked peel and the cooked pulp—are brought together in a mixing tank and then run into fifty gallon barrels. These are then preserved with Sulphur dioxide as usual. The whole

process of manufacture, from the time the fruit is washed until the pulp is put in the barrel, is carried on under the watchful eyes of agricultural marketing administration inspectors who see to it that each step is done just right.

Grapefruit and orange pulp are packed separately, but when the two products

reach Great Britain they are combined in the proportion of 60% grape fruit and 40% orange pulp. Sugar—purchased by the British from Cuba and elsewhere—is added in the preserving plants and the mixture is cooked. The sulphur dioxide boils off in a hurry, leaving the marmalade ready for the jars."



Seasonal Notes on Work Among Bees in the Plains—

By

L. N. Kaul.

OCTOBER. Bee season commences. Start building up of weak colonies by rapid feeding. Feeding will stimulate the **Queen** to lay eggs. Don't make thin syrup. Make a thick paste of half honey and half fine powder sugar otherwise bees might get dysentery. Strong stocks must yield surplus honey in the coming months. Watch the bees and then help them.

NOVEMBER. Keep the entrance small and put quilt on the frames under the inner lid, otherwise brood must get chilled as the temperature inside the hive goes down if there is a smaller number of bees. During this month bees will be able to collect enough nectar for their needs and for storing in the cells.

DECEMBER. Examine your hives usually at noon when a large number of adult bees are out in the fields. Too much manipulation spoils the colonies during winter months. Don't upset the natural arrangement of the hive. Keep brood frames near each other in the centre. Only insert drawn out foundation between the brood frames otherwise the **Queen** will go out of gear. Choose sunny days for manipulation as bees break their cluster when the temperature goes up. Entrances for strong colonies may be kept 3 or 4 inches but for weak colonies it is too much and

may be reduced to two bee-way space or one inch wide. Replace quilts if damp. Examine if outer covers are rain proof. If the weather is very cool and the bees cannot fly out to forage then feed them with candy.

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A Directory of Approved Nurseries, Seed Houses and Gardening Firms

With a view to place before the fruit growing public of various provinces a list of reliable Nurseries, Seed Houses and Gardening Firms, the Punjab Fruit Development Board introduced the registration scheme, details of which have already been published in the October 1940 issue of this journal. The criterion of reliability, fixed by the Board, is that the firm concerned must be able to procure a favourable report from the Agricultural Department of the Province to which it belongs.

Under this Scheme the following firms have so far been registered and they guarantee to supply reliable healthy plants, seeds etc. viz., true to parentage and free from insect and fungus pests.

PUNJAB Nurseries

1. Messrs. Brij Lal Orchards, Pathankote.
2. Sardar Garden & Nursery, Village and P. O. Chak No. 17/1 A.L. Sardarpur (Tehsil Okara & Distt. Montgomery).
3. Kot Ganesh Das Farm, Mian Channu, Distt. Multan.
4. Messrs. Indian Mildura Fruit Farm, Ltd., Renala Khurd, Distt. Montgomery.
5. The Manager, Jamalpur Fruit Farm, via Sarna Railway Station near Patbankote.
6. M/s. B. B. Bannerji and Sons, Nurserymen, Saraswati Gardens, Simla E.
7. Messrs. Popular Nurseries and Fruit Farm, Gujranwala.
8. Bakhshi Kanhya Lal, Advocate, Gujranwala.
9. The Manager, Feroz Gardens and Nurseries, Village Mahmud Buti, near Hydro-Electric Power Station, Shalimar, Lahore.
10. S. Kartar Singh Dewana, Dewana Fruit Farm Chak No. 370, Sardarwala, P. O. Parkarabad, Distt. Sheikhpura.
11. Bakhshi Garden, Nurpur (Railway Station) Nurpur Road, Distt. Kangra.
12. Khalsa College Nursery, Amritsar.
13. The Nazir Nurseries and Fruit Farm, Gujranwala.
14. Ch. Siraj Din, Plant Seller, Lawrence Road, Lahore.
15. Parkash Nursery, Muzaffargarh, Punjab.
16. Mushtaq Gardens and Nursery, Mian Channu.
17. Rajindar Nursery & Fruit Orchards, Civil Lines, Gujranwala.
18. M/s. Latif Gardens & Nurseries, Panipat (Distt. Karnal).
19. M/s. Bhagat Singh and Sons, V. and P. O. Chak No. 463, G. B. Via Samundari, Distt. Lyallpur.

U.P.

Nurseries

1. Messrs. Raghunandan Sah & Sons, Govindpuri, Muzaffarpur.
2. Messrs. L. R. Brothers, Saharanpur.
3. Henbane Nursery, Saharanpur.
4. The Paramount Nursery, Kuarsi, Aligarh (U. P.)

Seed Houses.

1. The American Seed Stores, Fyzabad.

BOMBAY.

Seed Houses.

1. Messrs Pestonji P. Pocha and Sons, 8 Napier Road, Poona.
2. Messrs N. Cooper and Co., 21, Wellesley Road, Poona, 1.

Nurseries

1. Messrs. Garden Supplies Co., Ville Parle, Bombay.

MADRAS.

Nurseries

1. M/s. E. R. Sampanji and Sons, Lalbagh, Fort Road, Bangalore City.

Gardening Firm

1. M/s. Standard Furniture, Co., Kalai Malabar (India).

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